THE JOURNAL OF GAS LIGHTING
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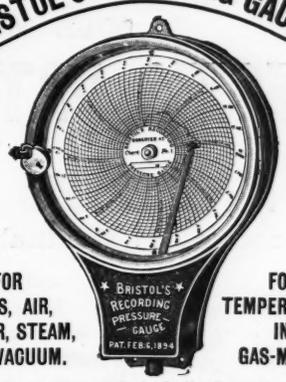

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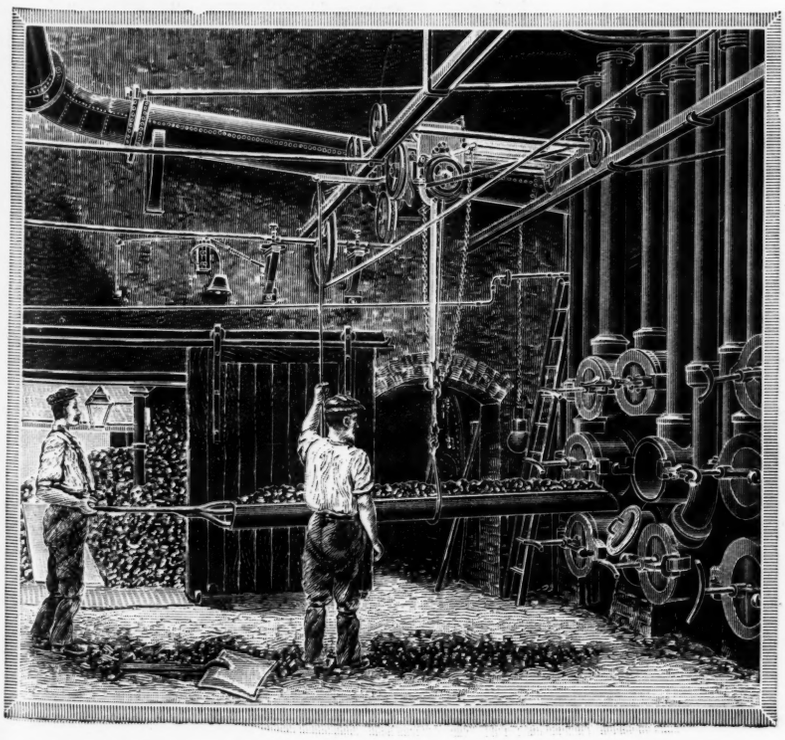

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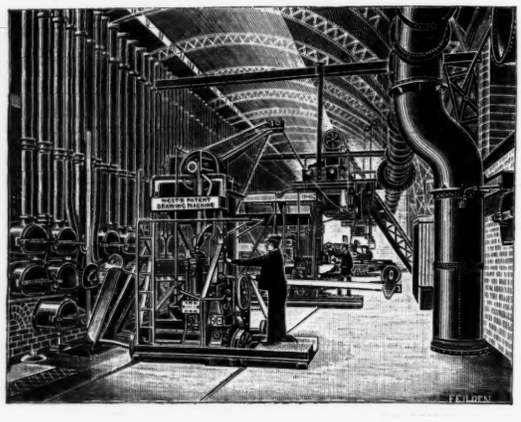

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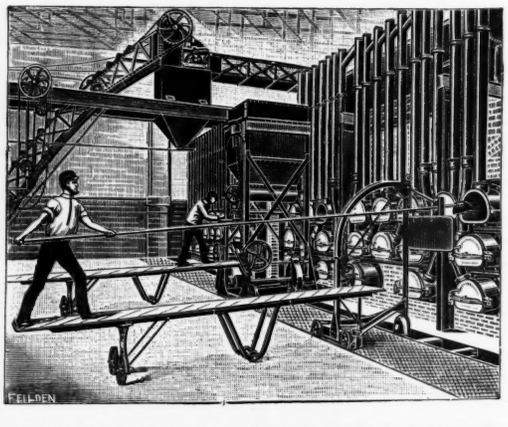

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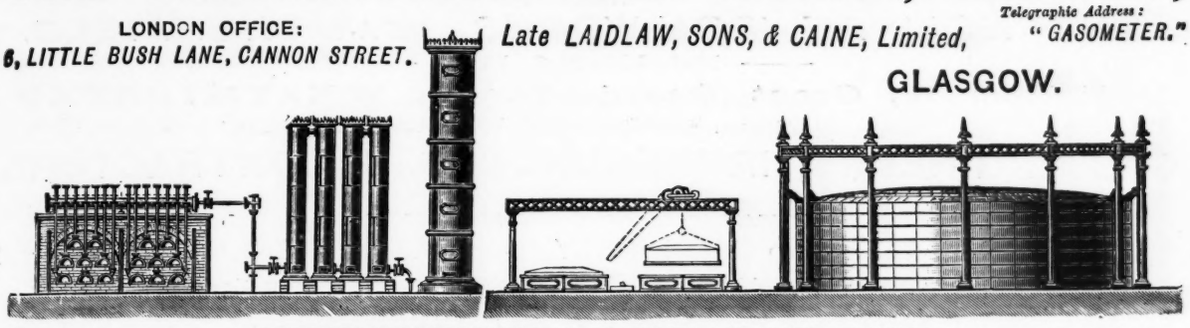

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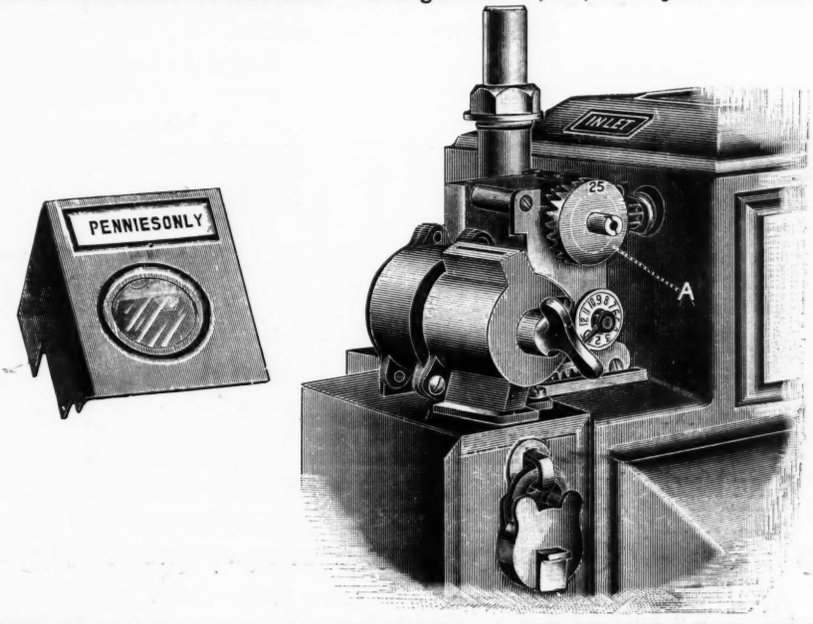

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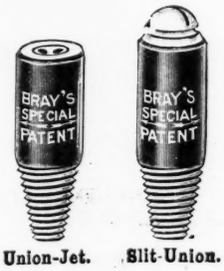

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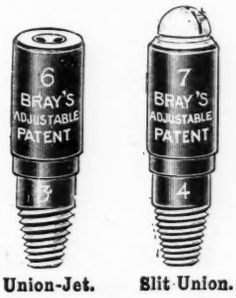

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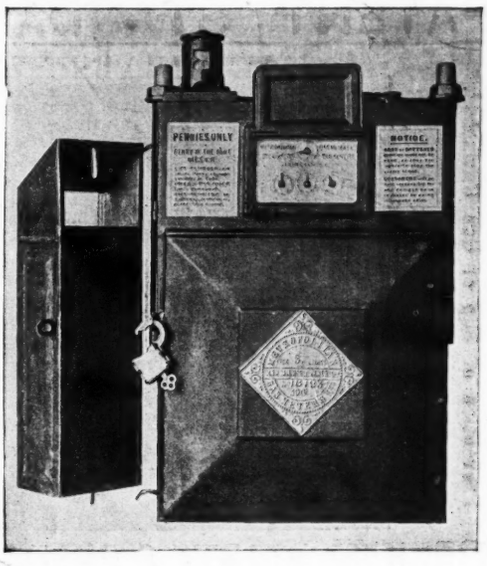

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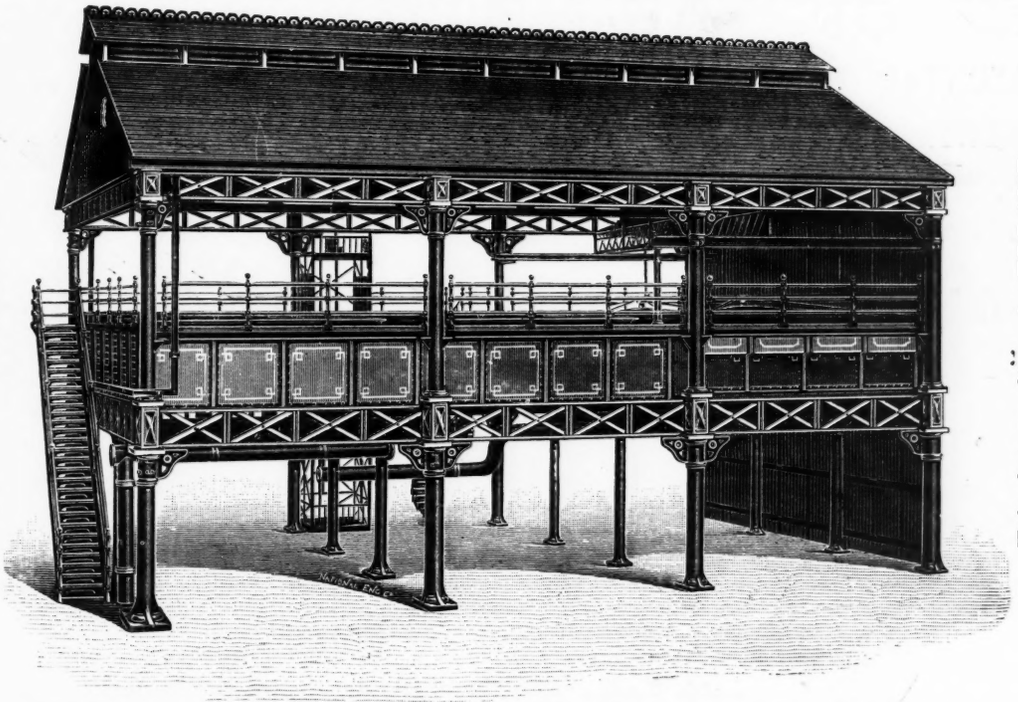

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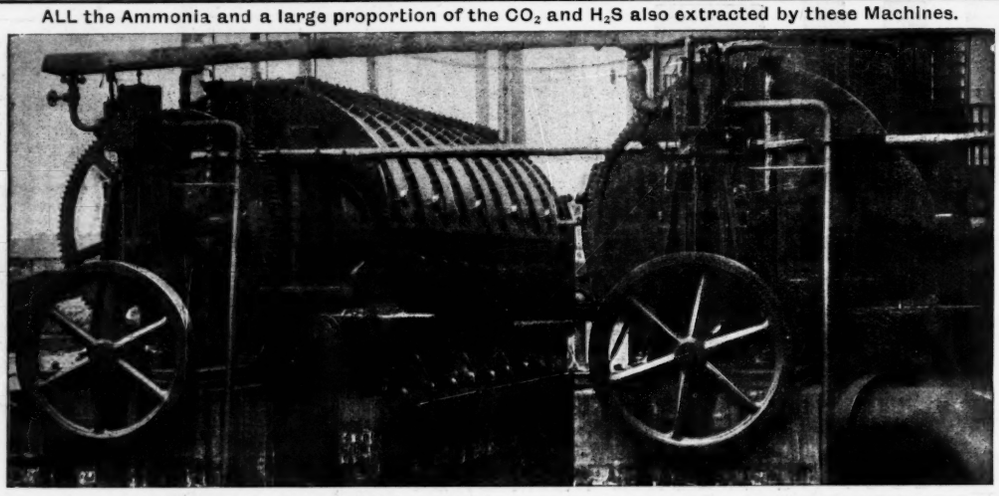

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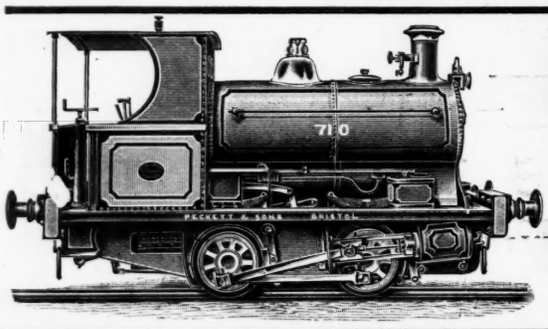

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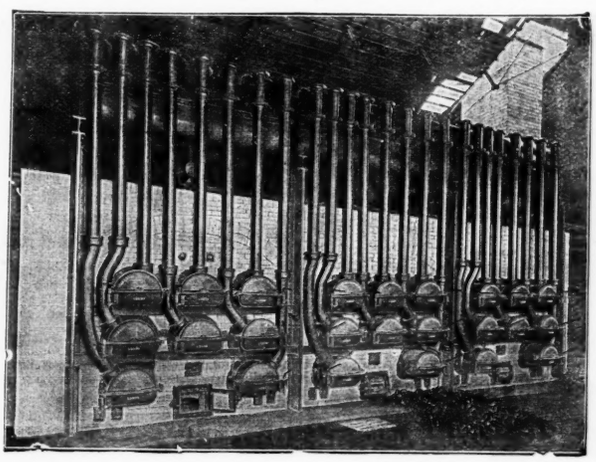

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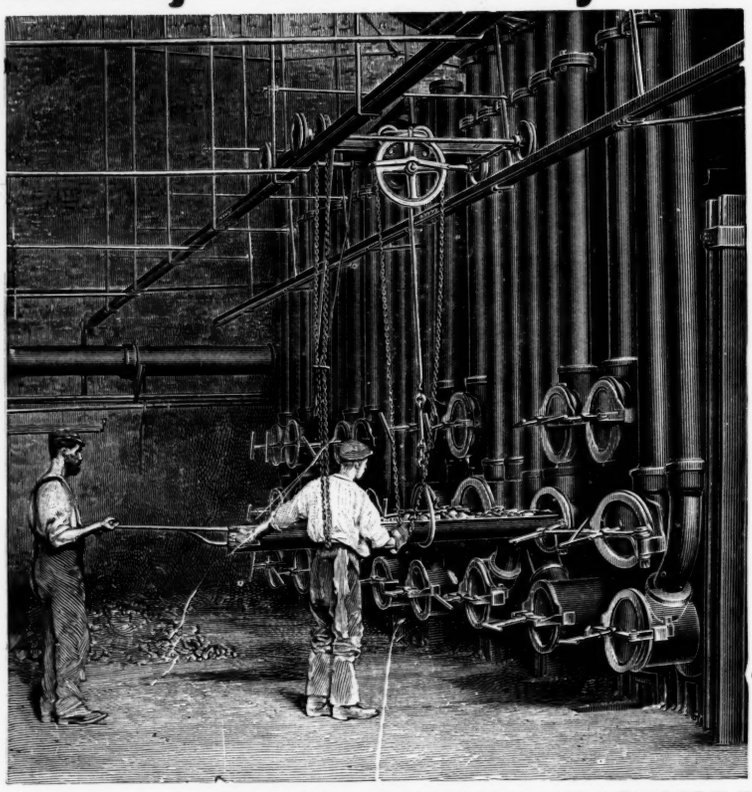

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CONTENTS.

EDITORIAL NOTES.

GAS, LIGHTING, &c.—
Fresh Light on the Law of Mainlaying in Highways 1433
Manchester District Engineers and the Wakefield Inclined Retorts 1433
The President of the Local Government Board on Municipal Finance 1434
Marking Time in South Wales 1434
Parliamentary Notices for Next Session 1435
London County Council and the Lights of London 1435
A Mediæval Assessment of Labour and Land 1435
WATER AFFAIRS—
Proposed Water Legislation for Next Session 1436
Questionable Tactics 1436

ESSAYS AND REVIEWS.

Odds-and-Ends from Wakefield 1437
The Economy of Bye-Products Recovery Coke Manufacture. 1438
The Vienna Municipal Gas-Works . . . 1439
Regulation of Street-Lamps and Signs . . 1442
Electric Lighting Memoranda 1443
Gas and Water Stock Market 1443

COMMUNICATED ARTICLE.

The Economical Advantages of Inclined Retort-Settings. By W. R. Herring . . 1445

NOTES.

Coating Cast Iron with Lead 1446
Some Points of Calorimeters 1446
A Remarkable Effect of the English Patent Law 1446
Burning Gas Under Water 1447
Wood-Stave Pipe for Force Mains . . . 1447

PARLIAMENTARY INTELLIGENCE.

Notices given for Bills (Session 1902) relating to Gas and Water Supply 1467
Provisional Order Applications (Session 1902) 1469

TECHNICAL RECORD.

Manchester District Institution of Gas Engineers—
General Business 1447
Mr. H. Townsend on the Wakefield Gas-Works 1448
Manchester and District Junior Gas Association—Mr. Casmey on High-Pressure Gas Lighting 1456
American Gaslight Association 1458
Further Notes on Retort-House Practice. By Mr. E. H. Earnshaw 1460

REGISTER OF PATENTS.

Coin-Controlled Mechanism for Use with Prepayment Gas-Meters—Marland, W.W. and Large, E. 1463
Incandescent Gas-Burners—Mallol, J. . . 1464
Automatic Gas-Igniters—Thompson, W. P. (Simonini, A.) 1464
Gas-Engines—Letombe, L. A. 1464
Bunsen Burners—Ihle, G. 1465

CORRESPONDENCE.

Inclined *versus* Horizontal Retorts . . . 1465
Naphthalene 1466
Comparative Cost of Gas and Electric Lighting 1466
Coal-Stack Fires 1466
Important to Statutory Gas and Water Companies 1466

LEGAL INTELLIGENCE.

High Court of Justice—Chancery Division—Illegal Interference with Roads and Electric Wires at Walker 147

MISCELLANEOUS NEWS.

Incandescent Gas Lighting in London . . 1471
Devonport Gas-Works Purchase 1471
The New Gas-Works for Hastings . . . 1471
Subways in London Streets 1472
Glasgow Gas and Water Supply—Corporation Lectures 1472

MISCELLANEOUS NEWS (*continued*)—

The Cement Trade and the Price of Coke . 1472
Sales of Stocks and Shares. 1472
Gas Supply of Bordeaux 1473
Electric Lighting Notes 1473
Rating of the East London Water Company 1474
Teignmouth Water Supply. 1475
Stock and Share List 1475
Notes from Scotland 1476
Current Sales of Gas Products 1477
Coal Trade Reports 1478

PARAGRAPHS.

"Lass's Analysis"—The Mond Gas Scheme 1437
Obituary and Personal 1444
The Next "James Forrest" Lecture—London County Council and Water Gas . . 1444
Private Bills for Next Session—Municipal Sanitation in the United States—Spontaneous Combustion of Coal. 1458
Incandescent Gas Lighting in Winchester—Brixham Water Supply — Portsmouth Water Company 1467
General Gas Company of France—Gas-Engines and the Abatement of Smoke . 1470
Outdoor Lighting by Acetylene—Gas Explosion at Blackburn 1475
Abertillery Water Supply—Incandescent Gas Lighting at Leighton Buzzard 1477
Vyrnwy Water for Wallasey—Honiton Water Supply 1478
Reduction to Large Gas Consumers at Dudley—Hornsey Gas Company—Gas Workers' Wages at Leeds—Condition of the Clonmel Gas-Works—Heywood Water-Works Extensions—Barry Gas and Water Supply—Gas-Engine Development 1479
Faversham in Darkness—Protection of the Leeds Water Sources—The Leakage at the Butterley Reservoir — Penzance Water Supply—Settlement of the Gas Dispute at Rhos—Gas Explosions 1480

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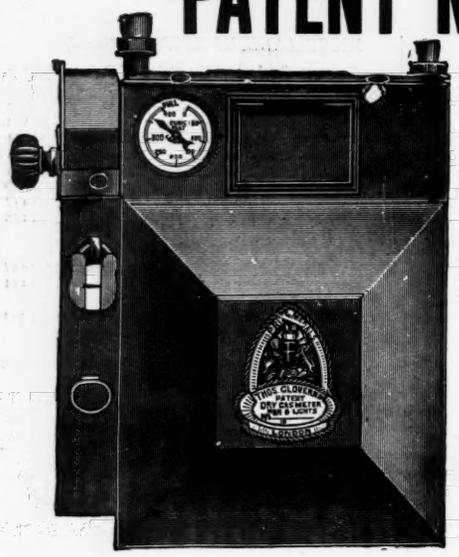

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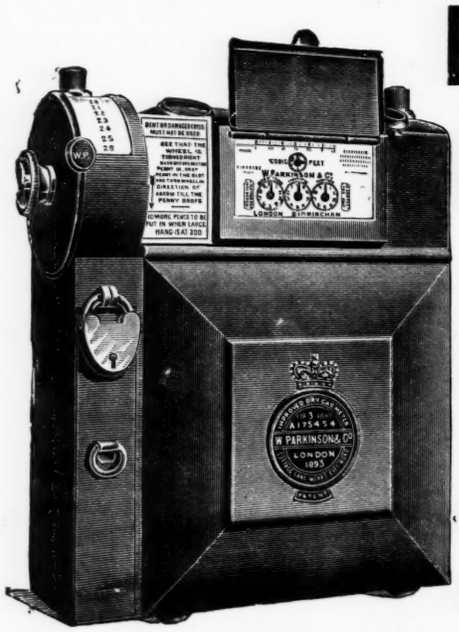

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EDITORIAL NOTES.

Fresh Light on the Law of Main-Laying in Highways.

RECENT transactions at Finchley, and now at Walker-upon-Tyne, have considerably cleared up the law relating to the power of highway authorities over the supplementary uses of the roads under their control, against which gas and water companies are constrained to protect themselves by availing themselves of the Acts of 1847. The nature of these rights has frequently been misunderstood by all parties concerned, whether as highway authorities or as users of the roads for the purpose of main-laying and all that this entails. These misunderstandings have arisen in a great variety of circumstances, and have ramified into very remarkable developments. The obligation upon those whose business necessitates interconnection between their works and their customers' premises by means of pipes or wires to obtain statutory protection for these connections, is generally, and correctly, referred to the practical necessity that usually exists for their making use of the public roads for effecting this purpose. It is commonly understood that, but for this necessity for making use of the public highways for main-laying purposes, Gas and Water Works Clauses Acts would not be required. For instance, if a private gas-works exists on certain premises, there is no law against any number of adjoining properties being supplied with gas from this source, provided that the supply main does not cross, or go through, a public road. Even if it does, there is no wrong done to anybody by the mere fact. The powers and rights of the highway authorities do not extend above or below the surface of the roadway, to which alone their responsibility attaches. Masterful local authorities sometimes forget this particular truth.

At Finchley recently, the District Council went so far beyond their legal powers as to cut a wire that stretched across the roadway from one support on private property to another. At Walker, the District Council have tried to prevent a local firm whose premises occupied both sides of a road from carrying a wire from one side to the other, underneath the surface, and then have been discomfited at the hands of Mr. Justice Farwell. There were peculiar circumstances and interests involved in the case; but these need not concern anybody except the parties to the litigation. The value of the judgment consists in the renewed declaration that the local authority had no property in the subsoil. Had the owners of the frontages simply drilled a hole through the subsoil, and then thrust a pipe through it, there could have been no interference by the local authority. That is the short point. Mr. Justice Farwell remarked that he had not to try the question of how far trading municipalities are justified in using, for the purposes of their trade, powers entrusted to them as custodians of the public health. He would say no more on that point at present, except that he thought "it could hardly be a reasonable "use of their powers by local authorities." There is plenty of room for applications of this observation.

The Manchester District Engineers and the Wakefield Inclined Retorts.

FOR the first time in its long career, the Manchester District Institution of Gas Engineers has visited Wakefield. The reason why there has been this neglect of the ancient city we cannot tell; but this we do know that, till Mr. Townsend took command of the gas-works, there was absolutely nothing of real technical value upon them to hold out any inducement for a formal visit of inspection by a body of gas engineers. We do not say this by way of reproach of the Board of Directors, because circumstances may have rendered it inexpedient to make changes in the way of modernizing the plant at an earlier date. But to the truth of this the works to day stand witness, that very soon after the advent of Mr. Townsend at Wakefield, the Directors adopted the good old business precept *tempori parendum;* and moved with the times they have, with a striking financial advantage. A new retort-house on the inclined system, a De Brouwer coke-conveyor with a model arrangement for coke distribution on the storage-ground, new purifiers on the most approved principle, and a general re-arrangement of the other plant, sums up the scheme of improvement so far as it has gone. There is one thing we admire in the way Mr. Townsend approached the work which he found before him. It is clear from what he told his visitors on Saturday, and from the paper he read to them, that he had no predilection for this or that system of carbonization; but he, like a true engineer, took the first subject with which he had to deal—that was the site—and then decided on the system of modern carbonizing which that site would best and most comfortably accommodate. Mr. Townsend proves his case for determining in favour of inclines as the most suitable for his circumstances in regard to the site with which he had to deal.

Then we come to the financial aspect of the change made; and there again Mr. Townsend has done well for his Company. Having said this, we feel disposed to mildly quarrel with him (without causing a breach of friendship) over the publication of the comparison he makes between the cost of working the brand-new inclined retort-house, and the antiquated, dilapidated, worn-out, direct-fired horizontal settings which formerly cumbered the same ground. It is true he has made a saving of 1s. 3·28d. per ton of coal carbonized; but what earthly good is the knowledge of this figure to the world at large? We admit that there is some gratification to an engineer in knowing that he has effected a saving to this extent; and we admit that Mr. Townsend called attention to the diverse conditions of the subjects of comparison. But, as the discussion of his paper last Saturday proved, those inharmonious and matchless conditions are lost sight of by others in considering the financial side of the question, and the comparison shrinks from conditions to systems, which, to say the least, is not fair to one of the two systems. Again, it is utterly futile for engineers to continue to shell out figures as to the working costs of inclines, until some common agreement is come to as to what shall and what shall not be included in those costs. Let anyone carefully read Saturday's discussion, and we think he will fall in with the view that a few such debates as that was will do infinity of harm to the progress of the inclined system—

> As the proud tow'r, whose points the clouds did hit,
> By tongues' confusion was to ruin brought.

Worse confusion on the question there could not be than is revealed by this one discussion; and we ask, and ask sincerely, whether something cannot be done to determine some common ground from which we may derive figures that are strictly comparable in regard to these costs. Then, and not till then, shall we know exactly what the inclined system can do; and every engineer who is considering the question of extensions will be able to determine whether or not he shall pronounce for the inclined or for his old system of working.

To initiate a step, we will suggest that a movement be made by the users of inclined retorts for the formation of a committee of gas engineers in this country—both users and non-users—to frame a definite list of items which would comprehend the various costs of the system, and then circulate it among the several engineers who have adopted the system, and ask them to supply the information—strictly adhering to the specified items. We fancy they will be only too glad to comply, if only in order to further the cause of their favoured system. We will do our part by throwing open the "JOURNAL" columns for the complete publication of the answers. With these before the gas profession, there would be something conclusive to work upon, and to discuss. Who will make the first move?

In connection with Saturday's proceedings, we have praised Mr. Townsend, we have taken the liberty of mildly reproving him, and we must complete the sandwich by recognizing the highly successful tone which his work and influence in Wakefield gave to Saturday's meeting. Points of interest now bristle in his works; and his paper portrays them. In them, the members found sufficient to promote vigorous inquiry, conversation, and discussion; and the effects will not speedily wear off. Then Mr. Townsend's

influence, and the attachment of his Board to him, brought to the Institution hosts of generous disposition. We congratulate the Directors on having an Engineer of the professional calibre of Mr. Townsend, and that gentleman on having a Board who desire that their works shall stand in the most advanced rank of gas undertakings. There was nothing in the ordinary proceedings of the Institution which need be mentioned here, save the election of Mr. Arthur Graham, of Mansfield, to the presidency. To that honourable position the members will accord him a hearty welcome next February; and in that welcome we shall most cordially unite.

The President of the Local Government Board on Municipal Finance.

THE President of the Local Government Board on Friday last received a deputation from the Association of Municipal Corporations, headed by the indispensable Sir Albert Rollit, M.P., who kindly set out the various lines upon which they desired the Government to proceed in further legislating for local self-government. Nothing of a revolutionary nature was demanded by this eminently respectable organization of Town Clerkdom; and for reward the deputation had the great satisfaction of hearing from the Minister the flattering assurance of his agreement with very many of their views. If members of the Association who happen to be represented in the Commons by any of the obnoxious kind of politicians whose loquacity and vanity impel them to be always hindering business, would find a means of conveying to these public nuisances a sense of what is due to the Nation in the way of useful legislative reforms, they would do a most excellent service. Otherwise it is to be feared that the best departmental plans will not receive their deserts.

Mr. Long assured the deputation that the codification of the law of Public Health is a subject very near his official heart. He is prepared to deal with it whenever opportunity permits. But the orders of the Association were so large that the life of one Minister would not suffice to fulfil them with the aid of a slow-moving Legislature. The great difficulty of passing a Consolidation of Statutes Bill as a non-contentious measure lies in the circumstance that consolidation is sometimes alteration of the law, and consequently arouses suspicion. Another desirable reform is that of continually passing Clauses Bills as adoptive Acts which public bodies can take whenever they go to Parliament, and thereby equip themselves with approved powers without incurring the expense of specially applying for them.

Then there is the usual complaint of the costliness of the Private Bill system, and demand for extension of the Provisional Order system. As Mr. Long pointed out, it may be possible to expedite the procedure of Committees by referring to them, not Bills as a whole, but particular groups of clauses relating to specific details. It is good news that this reform is actually under consideration by the authorities of the House. An illustration in point readily suggests itself in respect to the clauses of Gas Bills defining the business of a gas company, enabling the company to deal in gas-fittings, to exercise some control over consumers' fittings, and so forth. If every distinct proposal of the kind which is of individual origin, but capable of general application, were considered by a Committee on its merits, and not merely as a clause of a particular Bill, it would be a capital improvement.

Only, it is impossible to agree that anything that can be effected in this way will very materially reduce that cost of Private Bill promotion and opposition of which the Association complained through Sir Albert Rollit when he said that £7,500,000 had been spent by local authorities on obtaining Bills for the most useful purposes in the last few years. If it had been the practice of Parliament to give costs against corporation promoters of flagrantly wrongful and unnecessary Bills, the figure would be largely increased. It suits the book of municipalizers to argue that to obtain simple statutory facilities for carrying on necessary public works costs enormous sums; but what they judiciously omit to own up to is the truth that it is the propensity to interfere with private interests, by uncalled for and high-handed projects, which costs local authorities so much money. To quote two leading instances, which doubtless entered into Sir A. Rollit's calculations, how much of the parliamentary costs of the London County Council and of the Dublin Corporation would he himself consider to have been reasonably incurred?

Sir A. Rollit begged the Department to reconsider the question of the periods prescribed for the redemption of loca authorities' loans—particularly those for the housing of the poor. In reply, Mr. Long went beyond this limitation of the bearing of the question, and showed that the whole problem of the redemption of local loans is ripe for reconsideration. He denied that the burden of repayment of capital weighs with crushing effect upon the construction of town dwellings, and hinted that local authorities, like other people, must remember that there is a "hereafter." He graciously conceded, however, that it is impossible to leave this question of the period of loans exactly where it is. The subject is being investigated in the office; but the result has not yet been reported. But if it should be too big a job for the President of the Local Government Board to tackle on his own initiative, he is going to ask the Government to consent to appoint a strong Committee of Inquiry, upon whose report the Government would be justified in taking action. That is a very satisfactory statement. It is quite possible, we imagine, that the principle of classification might, with marked advantage, be carried farther in the treatment of local authorities' loans.

While saying this, it must be recognized that the hopes of local authorities will be disappointed if they are fixed upon the prospect of a return to the practice put an end to by Sir Stafford Northcote, who first drew attention to the propensity of public bodies to pledge the future. The day of 100-year loans is past, with rare exceptions for cases of heavy works of water supply or land reclamation, which will be treated on their merits. With respect to the loans taken up by local authorities for trading purposes, the probability is that the periods will be shortened rather than lengthened. This observation applies particularly to borrowings for gas and electric lighting purposes. It is not the smallest of the advantages of the stock conversions of gas companies, that their capital burdens have thereby been shown to be rather less than would result from the transfer of the undertakings to public bodies; thus demolishing the familiar plea for expropriation based upon the cheapness of local authorities' loans. In the case of electric lighting loans, the reluctance of local authorities engaged in this business to provide for depreciation cannot have escaped the Argus-eyed Treasury officials. One remedy for the evil will be to shorten the period of all extension loans to twelve or fifteen years. This will make the so-called "Dublin prin-"ciple" more of a reality; but the borrowers will certainly not like it.

Marking Time in South Wales.

THE situation in the South Wales coalfields remains practically unaltered, the future being still very uncertain. Last Wednesday was, in accordance with the edict of the men's leaders, observed as a general holiday by the miners—that being the fifth day on which they have "played" during the past few weeks. The stoppage was made the occasion of addresses by some of the leading spirits, who repeated the accustomed fallacious arguments in favour of the policy of restricting output. The possibility of the competition of American coal in any way affecting the situation was scornfully pooh-poohed by Mr. W. Brace. There was no reason, he remarked, why the fact that "a few tons" (a few hundred thousands tons would have been more accurate) of American coal had gone to markets usually supplied by Wales, should be used as an argument for bringing prices down unfairly. "So long as South Wales coal was not forced to an abnormal "point, there was no danger of our losing our markets." Yet Mr. Brace and his colleagues are at the present moment seeking deliberately, by their stop-day policy, to force the price of South Wales coal to an abnormal point—the normal point being that fixed by free competition.

Mr. Brace went on to intimate that, unless the contracts which are now pending, and which neither party cares to conclude owing to the uncertain outlook, were settled at prices satisfactory to the men, "the men would take their "own action to checkmate them;" so that "nothing would "be gained by a policy of postponement in the making of "those contracts. . . . There must be no attempt on "the part of buyers of coal to juggle with the market by "holding off for the purpose of depressing prices." Was there ever a cooler assumption by working men of the right to dictate, not only to their employers, but to customers of their employers? In view of this bombastic talk, it is interesting to note that the Admiralty, who are in the market for about 500,000 tons of Welsh coal, have issued circulars postponing until the 11th inst. the date by which

tenders must be received. Meanwhile, prices are showing a tendency to harden—in the North of England!

The "few tons" of American coal to which Mr. Brace referred as being sent to markets hitherto exclusively our preserve, are, as it happens, on the increase; the Pennsylvanian collieries making strenuous efforts to get a good footing in the Mediterranean, being assisted by the low freights which British shipowners are glad to accept at the present moment. The difference between the freight now charged from Newport News to Genoa, and that from Cardiff to Genoa, is only some 4s. per ton; so that, considering the very low prime cost of coal in America (where the mines are shallow, and machinery is used for getting a large proportion of the output), it is obvious that a maintenance of the high prices for Welsh coal means holding the door open for our Yankee competitors. For Pennsylvanian coal to be supplied in Germany, Italy, and France, at a price materially lower than British, ought to be, in colloquial phrase, an "eye-"opener" for the British collier; but it is not. He simply ignores the facts, and declares any suggestion of foreign competition to be a "bogey" created by his employer just to frighten him into accepting a reasonable rate of wage; and he declines to be frightened into so doing. Not he; rather than accept a lower rate, he will do much less work, content to take considerably less wages in the aggregate if only he can "checkmate" the coalowner, who is so anxious to spoil his own business, and whom the miner is so desirous of saving from himself. What a pity the Union leaders have acquired so much power, without first acquiring the knowledge and wisdom necessary to its rightful handling.

The result of the audit of the coalowners' returns for the two months August and September, which was made known only on Friday last, will make rather for present peace; the reduction in the rate of wages payable under the sliding-scale being less rather than more than that anticipated. The ascertained average price causes a reduction of 2½ per cent. on the standard rates; leaving wages at 66¼ per cent. above standard, as compared with the record of 78¾ per cent. reached in April last. It will be remembered that the men's proposal is that 70 per cent. should be made the maximum and 40 per cent. the minimum, after the present agreement expires; and, as there is no doubt they would gladly accept a maximum of 60 per cent., the fact that for another two months they are assured the before-mentioned wage of 66¼ per cent. above 1879 rates, tends to remove from their minds any desire for precipitate action. The writs in regard to the stoppages ordered by the men's leaders have been served upon such of the leaders as are parties to the sliding-scale agreement; but the proceedings are certain to extend over a considerable period of time—an eventual appeal to the House of Lords being a practical certainty. So that, unless the men, by their aggressiveness, render the situation intolerable by the employers, the fire appears likely to smoulder for the present. It is to be hoped that the wages question will not yet arise in any other district of the coalfields of Great Britain. It is, unfortunately, never far from the surface.

The Parliamentary Notices for Next Session.

In the present issue of the "Journal," we complete our customary list of the Parliamentary Notices of Gas Bills and Provisional Orders for the ensuing session. Their number is again considerable, proving that the tide of statutory activity in the British gas industry is still flowing. In no other form can so condensed a statement be obtained indicative of the growth of the industry—not in one or two places only or chiefly, but all over the country. There is no "advertisement" in the bad sense about this; it is all the soberest fact. Most of the notices refer to the usual requirements of a growing gas company—more capital, additional lands, consolidation of stocks, and the like. There are other points in some of these notices, however, which show how the principles of gas supply are changing with the times. We have already commented in these columns upon the intended applications to Parliament of the South Metropolitan and Commercial Gas Companies, and also of the Birmingham Corporation. These are the most striking indications of the trend of British gas polity; but there are others. Various applicants desire to alter the illuminating power and price of their gas, and some have so far profited by the lesson of the Mond Act of last session that they seek permission to supply any and every description of gas that will sell for the purposes of power, heating, or incandescent lighting. The wheel is evidently turning fast; and the time has come for the settlement of several new model clauses. Among the Provisional Orders will be found indications of the moving of the new spirit; and the Secretary for Scotland will be called upon to allow yet another Scottish Gas Company to reduce their illuminating power down to 16 candles. Two applications to the Irish Local Government Board shows that gas supply is under the protection of the Board; but Belfast and Omagh find it expedient to submit their gas affairs to the Imperial Parliament. On the whole, therefore, the coming parliamentary session bids fair to be both a busy and an interesting one as regards gas. There does not appear to be any strikingly new development in progress; but the application of precedents not yet wholly above controversy will afford several problems for Select Committees.

The London County Council and the Lights of London.

Really, it is difficult to keep pace with the headlong proceedings of the London County Council in their pursuit of the campaign of general conquest of which every successive parliamentary session brings fresh revelations. Not to recapitulate the confessed ambitions of this amazing body, it will still create a mild sensation of astonishment when it is known that the Council have given notice of a Bill for the municipalization of the whole of the electricity supply undertakings of the Metropolis which are the property of Companies. The why or the wherefore of this startling project is equally mysterious. The announcement comes like the proverbial "bolt from the blue," so far as concerns the lack of any preliminary expression of public opinion on the policy of the proceedings. The notice has duly appeared; and that is all that the outer world is permitted to know of the matter. Meanwhile, a glance at the extent of the interest which the Council proposes to expropriate in this sudden fashion will not be wasted. The Companies affected number fourteen; and their capital expenditure amounts to £8,085,337.

The object of the proposed Bill is to acquire all these undertakings by agreement or compulsory purchase. For this purpose, the Council will seek to vest itself in a much more distinctly municipal garb than it actually possesses, by combination with the Councils of the London cities and boroughs. There is to be the usual administrative paraphernalia of Joint Committees. A special stock issue is contemplated; and the County Council desire to be empowered to supply electric energy in bulk. What a pretty self-confidence it has, to be sure! Of course, every Act of Parliament that stands in the way of this vaulting ambition is to be cleared away. For instance, as regards the compulsory purchase of the Companies' property, it is proposed to make the statutory concessions of 42 years' independent existence date uniformly from Aug. 26, 1889, "or such other "period as may be defined in the Bill." The electrical journals reasonably want to know what this outburst means, and especially what advantage London ratepayers are supposed to derive from this wholesale suppression of private enterprise and the transfer of the whole business of Metropolitan electricity supply to amateur hands.

On the face of it, it appears to be an example of Progressivism run mad and calling for restraint. At this rate, no private enterprise for the supply of London with a necessary of town life can be regarded as safe from the amazing cupidity of Spring Gardens. The existing majority of the Council were adjured not long since to practise moderation in regard to their parliamentary activities; and the response is more adventure of the kind than ever. Some check will have to be found for this crying abuse of the parliamentary privileges of the Council. There has never been anything like it. It would be much better for them to promote a Bill with the object of getting rid of parliamentary control altogether. Of course, the London ratepayers are to blame for returning such a swelled-headed list of Socialists at the last election; but that is another story.

A Mediæval Assessment of Labour and Land.

There are not a few old-fashioned persons in the world who entertain a lingering respect for the wisdom of the Ancients. The influence of this real, but not often acknowledged, belief crops up in the most unexpected places. It probably underlies, much nearer the surface than is ever suspected, the rooted British dislike to change the familiar currency, and the weights and measures of native origin, for the alleged simpler and more scientific systems of the Latin Union and other nations. We believe, as a people, that our forbears who chose these units of value and measuremen

knew very well indeed what they were about. A parallel suggestion has recently come under notice which may be commended to the attention of readers expert in matters of the rating of gas-works and the adjustment of other charges on undertakings. We hear a good deal from time to time about the relative proportions of landlord's and tenant's interests, the share of labour, and so forth. Here is a striking account, taken from the "Pall Mall Gazette" of Saturday, of how these things were settled in the Middle Ages. The authority quoted is a French antiquarian writer. It appears that authentic records remain of the principle on which a French monastic establishment collected its agricultural rents in the Thirteenth Century. The steward of the domain was in attendance at the farmyard when the husbandman brought home his harvest. The farmer mounted the cart, unfastened the rope, and, in the presence of the collector, threw down the sheaves in elevens. Out of every eleven, three were set aside. Of these the collector took two—one for rent, the other for tithe; the third went as wages for the men. The remaining eight were for the farmer, who thus paid about 20 per cent. of his produce for his land, while something less than 10 per cent. went to the labourers. It is remarked that the division was not, on the whole, an unfair one, as all were paid by results. It would be interesting to know if all the parties were equally dissatisfied; because, of course, they were not more happy than their modern successors. The interesting question that arises here is, What has been the real improvement of modern methods upon this mediæval rule?

WATER AFFAIRS.

Proposed Water Legislation for Next Session.

In the last number of the "Journal," abstracts were given of the notices which had appeared for the Bills of the Government and the County Council to provide for the transfer of the undertakings of the London Water Companies to a public body—in the one case to a specially constituted Board, and in the other to the Council—as well as for those to be promoted by the Grand Junction and Kent Water Companies; and in another column to-day other abstracts will be found of the notices for Bills and Provisional Orders relating to the water supply of provincial towns. The two principal Bills affecting the Metropolis were dealt with last week. With regard to the other two, it is sufficient to say that they are to sanction extensions of the Companies' limits—the Grand Junction Company wishing to take in Sunbury, and the Kent Company Tatsfield and a portion of Westerham. Turning to the Provinces, the notices bear evidence that the severe drought of the past few months has emphasized the necessity for having water-works fully adequate to meet exceptional requirements. The Huddersfield Corporation will ask for a revival of powers granted in respect of their Butterley and Blakeley reservoirs; and the Nottingham Corporation will apply for authority to construct additional storage works. In the South, the Margate Corporation wish to carry out their Wingham scheme; and the Bristol Water Company to make two service reservoirs, with subsidiary works. Extensions of time are required by the Birkenhead, Birmingham, Newport (Mon.), and Swansea Corporations, as well as by the Newcastle and Gateshead Water Company, for the completion of certain works already sanctioned; and the last named will seek power to make some new conduits. A new Company will apply for incorporation for the supply of Ticehurst and district; and extensions of limits are sought by the East Worcestershire Company and others. Transfers are projected in the cases of the water-works at Barton-on-Sea, Devonport, and Whitstable—the parties seeking powers of acquisition being the West Hampshire Water Company, the Devonport Corporation, and the Whitstable Urban District Council; while the North Warwickshire Water Company desire to hand over a portion of their undertaking to the Coventry Corporation. A fusion of the Consett and Weardale and Shildon Water Companies is proposed; and Parliament will be asked to sanction the formation of Water Boards for the Neath and Aberavon and the Higham Ferrers and Rushden district. The Liverpool Corporation will endeavour to obtain authority to purchase lands for the protection of their Rivington reservoirs; and general powers of a similar nature will be included in other proposed Bills. Wolverhampton Corporation will renew their application to carry out some very important additions to their water-works, and endeavour to secure the co-operation, by the payment of compensation, of owners of wells in the district in which the pumping-stations will be situated. New works and extensions of limits are the features of the applications for Provisional Orders; and both these and the Bills will contain the necessary provisions for raising capital where it is required. Outside the Metropolis, the water schemes for next session do not promise to be very exciting.

Questionable Tactics.

Now that the scheme of the London County Council for the acquisition of the undertakings of the Water Companies and the control of the supply has been once more fairly launched, the Progressive members of that body and their supporters—or shall we say their servants?—in the Press are resorting to their old tactics of depreciating the property they profess to be so anxious to possess. A great deal is attempted to be made of the point that the Companies have no monopoly in respect of the sale of water; and a suggestion has been thrown out that if Parliament would only arm a Progressive County Council with power to go to the Welsh mountains and lakes for an independent supply, so that they might compete with the apology for one with which London is now cursed, the mere possession of it, without its exercise, would so terrify the Companies that it would bring them to "a more reasonable frame of mind than they have shown "for centuries"! The profundity of this writer's knowledge of the London Water Question is immense. According to him, the Water Companies have been a bad lot from the very outset of their career. The possibility of municipal competition would, we are gravely assured, "destroy the "inflated monopoly values which attach to water under-"takings by reason of their assumption of monopoly rights "which Parliament never intended them to enjoy." As for the Companies' property, the pumping and storage plant is characterized as effete and inadequate; the mains are said to be buried underground, so that their actual condition (presumably worn out) cannot be readily appreciated; and, finally, there are a few old cisterns. Consequently, as the Companies have no goodwill in their business and no plant worth speaking of, they really have nothing to sell, and, therefore, an "old iron" price would be ample. As to the quality of their commodity, we are informed, by one who professes to be a "Water Expert," that Londoners but dimly realize its "vile and polluted character." If they did, he says, they would never rest until they had compelled Parliament to form a Central Water Authority and to immediately inaugurate a scheme for providing the Metropolis with a "pure and undefiled" water supply. It is a pity that, before making a sweeping assertion of the kind quoted above, the writer did not give his readers an opportunity of judging of his status as an "expert" by disclosing his name, because much more weight would then be attached to the so-called "facts" which he says London must consider. As one of these is to the effect that the New River Company depend entirely upon the River Lea for their supply, whereas they have no less than 14 wells within their district, we think the general public will be wise to accept his other statements with caution. If they require testimony to the quality of the London Water Supply, let them consult the monthly reports of Dr. Thorpe (the Government Analyst), Sir William Crookes, and Professor Dewar, and the weekly returns issued by the Registrar-General. The latter bear ample testimony to the general healthiness of London, notwithstanding that its water supply, according to our "Water Expert," is derived from "fright-"fully polluted sources." It is true that the Metropolis is just now suffering from an epidemic of a highly contagious disease; but it is one which is not generally attributed to the use of contaminated water. We have, however, been waiting for some wiseacre to rush into print and endeavour to prove that the outbreak is to be associated with the "pestiferous "fluid" which a set of grasping monopolists purvey at exorbitant charges to a long-suffering public; but we hardly expected to find that the individual who would thus distinguish himself would be a "Water Expert."

Reverting to the Companies' charges, about which we hear so much, how many consumers take the trouble to calculate what their payment for water comes to per week and per head, and consider what they get for their money? The Chairmen of the Southwark and Vauxhall and East London Companies have both demonstrated the reasonableness of their rates; and we cannot admit that, taking them all round, those of the other Companies can truthfully be

called "exorbitant." In the case of one Company—the West Middlesex—a rebate of 5 per cent. was instituted as far back as 1887, and increased to 10 per cent. in 1894. This was a purely voluntary act on the part of the Directors which should have met with due recognition. Unfortunately, circumstances have now compelled them to revert to the 5 per cent. As was fully explained by the Chairman (Mr. E. Boulnois, M.P.) at the recent half-yearly meeting, the Company have had to incur heavy expenditure of late years in providing a reserve of storage, which has not added anything to their revenue. Moreover, wages, coals, and rates and taxes have gone up, and so has the contribution which the Company have to make to the City Chamberlain's fund. The total increase in these and some other respects during the past four years has amounted to no less than £41,000. Hence the necessity for the reduction of the rebate, of which notice has been given to the various authorities in the district of the Company. This proceeding has roused Dr. J. Fletcher Little, who represents East Marylebone in the London County Council, who has found in the hospitable columns of the daily papers a vehicle for giving vent to his anger. He sees in the action of the Directors only "a bold attempt to mulct the ratepayers for "the advantage of a monopoly." But if the present financial condition of the Company, brought about partly by the increased borough rates which Dr. Fletcher Little admits, calls for the withdrawal of a concession voluntarily granted—and surely those who conduct the undertaking are much better judges of this than an outsider—the Directors are perfectly justified in doing it. Even under the new conditions, the consumers will get a 5 per cent. rebate on their rates, with a constant supply of water. Dr. Fletcher Little revives the old grievance on the subject of the proposed new (he calls them "hateful") regulations. He must know perfectly well that they were brought forward at the suggestion of the last Royal Commission; yet he prefers to ignore this, and attribute their introduction to purely mercenary motives on the part of the Companies. This, however, is only in accordance with the tactics employed by their opponents. But there is some consolation in the reflection that they will be estimated at their real worth, when the time comes for investigating the financial value of the water undertakings, and the manner in which they have been conducted, with the view to their transfer to a properly constituted public body—a body which, as the President of the Local Government Board remarked a few days ago, will manage them to the advantage of Londoners, and will not find it necessary to "seek for "popular applause, or advocate confiscation or robbery as "a claim on the affections of the electors."

"Lass's Analysis."—As will be seen by the announcement which appears elsewhere, the work which is so well known under the above short title has now reached its majority—the twenty-first issue having appeared last week. Our readers are aware that the scope of the "Analysis" has been extended of late years; and, as compiled by Messrs. Lass, Wood, and Drew, in addition to the accounts of the Metropolitan Water Companies, those of the Corporations of Edinburgh, Glasgow, and Manchester are dealt with. The former are for the year ending Dec. 31, 1900, or March 31, 1901; those for Manchester, for the year to March 31; and those for the two Scottish cities, for the year to May 15.

The Mond Gas Scheme.—The projectors of the scheme for the supply of Mond gas in the Midlands have not lost much time in taking steps for putting in force the powers conferred upon them by the Act they obtained last session, the principal provisions of which were noticed in the "JOURNAL" for the 22nd of October. It will be seen, by an announcement which appears elsewhere, that a Company has been formed, under the title of the South Staffordshire Mond Gas (Power and Heating) Company, with a capital of £1,000,000, in 96,500 ordinary, and 3500 "B" shares of £10 each, to manufacture and supply this gas within the South Staffordshire and East Worcestershire districts, extending to about 120 square miles, to manufacture and deal in sulphate of ammonia and other residual products, and generally carry out the objects specified in the Act. Authority has been obtained for the acquisition of seven sites, comprising about 134 acres, for the erection of works; and the Company's area includes fourteen important manufacturing centres. An agreement has been entered into between the Company and the Power-Gas Corporation, Limited, whose statutory meeting was reported a fortnight ago, for the construction of the works by the latter at cost price, *plus* 7½ per cent. The present issue is 45,000 ordinary shares, of which 4000 have been applied for by the Directors and their friends; and subscriptions are invited for the rest. The Chairman of the Company is Sir Benjamin Hingley, Bart., J.P.; the Deputy-Chairman, Dr. Ludwig Mond, F.R.S.; and the Consulting Engineer, Mr. Herbert A. Humphrey. The subscription list opens to-day, and will close on or before next Tuesday.

ESSAYS AND REVIEWS.

ODDS-AND-ENDS FROM WAKEFIELD.

THE city of Wakefield is not exactly the place that anyone would journey to, or sojourn in, in search of pleasure. Nothing but business, or personal friendships, would induce him to spend time within its bounds. As an industrial and trading centre, it undoubtedly stands well; but to the ordinary visitor its attractions, when its historical associations are exhausted, are absolutely *nil*. The streets in the centre of the city are narrow; and the chief impression one gets (at this time of the year) from the exterior of the buildings, shops, and dwelling-houses is that they are uniformly dingy and deplorably wanting in feature and picturesqueness. The shades of night hide the unpleasant aspect; and, however strong one's partizanship may be in favour of gas, one hardly knows whether or not to be thankful to the governing body for having given a preference to the electric light for the illumination of some of the streets after the hours of daylight, instead of to the incandescent gas-light (of which a few isolated examples are to be seen), for assuredly the latter would reveal more of the unsightliness of the streets than the pallid and stolid looking arcs which are supposed to protect the wayfarer in Wakefield from the perils of the streets and to keep his feet from wandering. If it were not for the shoplighting, an evening in the streets of the old city would indeed be a depressing experience. It is to be hoped that the City Council do not presume to set up their street illumination as a model; if they do, then we would ask them, for their own credit's sake, to abstain from further doing so.

We have spoken of the gas lighting; and truly the gas supply from our point of view is one of the brightest features of Wakefield—where properly used. The Gas Company certainly serve the inhabitants of the city well, and yet not under the most encouraging of circumstances. At this particular period, a 16½ to 17 candle gas service at 2s. 9d. per 1000 cubic feet (and it was cheaper before the prices of raw material compelled an increase) is, in worth for the money spent, far the best illuminant to be had in the city to-day—particularly when the gas is used in incandescent burners. These burners, by-the-way, the Gas Company have just started maintaining at the cost of 4d. each per month; and this system of maintenance bids fair to become popular. Although an institution of but a few days' age, something like forty consumers have taken advantage of it; and as it becomes known and better understood, it is likely to grow to an important branch of the Company's outdoor department. But whether the system will be self-supporting is another matter. We have a little doubt in our minds on the point on looking carefully at the expenses. Men, for instance, will have to be specially told off for the purpose; and the cleaning of the burners and the renewal of defective mantles, props, and chimneys seem a bit too much to be covered by a fraction of 1d. per week. Of course, the labour alone will absorb a good percentage of the outlay; and the remainder of the expense will depend very much on the consumer, whose agreement to pay the 4d. may, and will in some cases, give him the feeling that he is relieved of the obligation to defend his own pocket by a scrupulous regard to carefulness in respect of his burners. And yet, considered apart from the money payment, the system *will* pay. The maintenance of his incandescent burners in a healthy condition and a constant good light will give the user contentment, and the desire to turn to a "new love" is less likely to disturb him, and to eventually sever his business relations with the Gas Company. To gain the goodwill and satisfaction of the consumer, and the continuance of the sale of gas to him, is worth a price. Therefore, though there may not be money profit in this venture, there is profit of another and very beneficial order.

We have to confess that we have started at the wrong end in dealing with Wakefield gas matters; but it was the condition of the streets and the public lighting which struck us just before we sat down to write, and which led on to this track. Having, however, commenced backwards, we will continue to write in that direction by noticing one or two other features of the Company's business outside the works. And lest it be forgotten, we will take this opportunity of recognizing the thought and conspicuous energy which the record and position of the undertaking to-day disclose has been thrown by Mr. H. Townsend (since his appointment as Engineer and Manager in May, 1895) into the defence of the interests of the Company, and into the strengthening of the "factor of safety" of the business—in other words, into the broadening of the base of its stability by obtaining new consumers, and by studying their interests and convenience. In this work, he has had a good colleague in the Secretary (Mr. W. H. Parker); and the Board of Directors have given him every encouragement. The wholesale rebuilding and modernizing of the works which has lately been going on has to some extent temporarily deflected Mr. Townsend's attention from the outside business for a time; but nevertheless he has reached some notable results. For example, the Company have now some 3500 slot meters fixed; and they are still "going strong." With these meters, a breakfast griller is supplied; and this is found an excellent appendage to the system, as it finds favour with the consumer on account of its convenience, and it certainly, in an unostentatious way, promotes the best interests of the gas suppliers.

Another inducement to use gas for other than lighting purposes has been offered to all the ordinary consumers by the

Company. Some five or six months ago, there appeared on the accounts, a notice which informed the consumers that they could have a boiling-ring free by applying to the gas offices. Already 1000 of these rings have been fixed; and there is no doubt that this 1000 new outlets for gas will give a respectable account of themselves in the total consumption for the current half year. In regard to lighting, the Company also furnish to consumers flat-flame burners free on application.

There is an interesting feature about the price of gas at Wakefield. We have already mentioned that at the present time it is 2s. 9d. net per 1000 cubic feet—it having been raised by 3d. at the time of the great rise in the cost of coal. But the charge for gas is uniform all over Wakefield—not from choice, but by parliamentary enactment. However large the consumption may be in any one establishment, the proprietor is bound to pay exactly the same per 1000 cubic feet as the humblest of the Company's consumers. At one time of day, this inexorable law worked all right; but in these days of competition, the Company occasionally feel its severity when a large consumer seeks a concession, and, failing to obtain it, turns his attention to electric lighting. The question of differential prices has been shelved by our Associations for the time being; and may-be some of the quondam opponents would not now be so keen in their advocacy for uniformity as they were before electric light cables traversed their streets. The inflexible binding of the Wakefield Company in this regard came about as the result of agitation, as far back as 1847, when they were before Parliament with their Bill of that year; and it is to-day that they feel more than ever the hardship of the bondage. Still, notwithstanding this and the competition of the electric light, the Company are flourishing, and they will continue to do so while the present progressive spirit and enthusiasm pervades the conduct of their business.

We have a useful link for connecting the affairs of the district with the works themselves; and it takes the form of a little lesson on the question of leakage. It is this, that gas managers must not always be searching in the district for leakage, but that they must devote some little of the time to an inspection of the plant within their own walls. At Wakefield, in the past year the unaccounted-for gas amounted to 5·3 per cent.; while the year before it was 6·9 per cent. Now Mr. Townsend is convinced that the difference is mainly accounted for by the work which has been done on his gasholders—in other words, that a goodly part of the difference of 1·6 per cent. was finding freedom through the holder shell. Incidentally, it may be mentioned that Mr. Townsend has three gasholders with a combined capacity of 1,600,000 cubic feet. In this respect he is in a comfortable position, seeing that his record maximum consumption on a foggy day is in the neighbourhood of 1,400,000 cubic feet.

Through all that we have written runs evidence of energetic management. But it is in the gas-works that Mr. Townsend as an Engineer is seen. What is still standing of the old order of things there, is proof of the magnitude of the change he has wrought. If ever a gas-works reached a crazy state through increasing infirmities, those works were the former Wakefield ones; and no works could possibly have been more hampering to a manager of progressive proclivities, nor more wasteful or opposed more difficulties to successful working, than these. Such a condition of things could not remain long in company with Mr. Townsend; and the change he has effected is disclosing its profitable advantage in the balance-sheet, and the further improvements in contemplation will add yet further to the fruits of prudent advice, design, and outlay. We will not detract from the interest of the clear description of the modernizing scheme which Mr. Townsend gave the Manchester District Institution of Gas Engineers last Saturday, by referring here to the new works and alterations, beyond a point or two for the purpose of directing attention to them.

In the first place, full particulars will be obtained from Mr. Townsend's paper as to the new inclined retort-house and settings, and the reasons for adopting this system of carbonizing. The character of the site was the main consideration; and the Engineer laid his plans with the view of getting as much out of the site as possible. Visiting the works a few days since, we asked him whether he is so satisfied with the operation of the inclines that he does not now regret having adopted them. Mr. Townsend gave an affirmative reply, and directed a reference to the figures in his paper, remarking at the same time that there could be no comparison here with machine-worked houses in view of the circumstances of the site. The figures will be studied with keen interest by critics of the system and those champions of particular methods of working and forms of construction who cannot, and are not likely to, arrive at a common agreement—anyway for the moment. Here is a point which will make some of the inclined specialists rub their eyes. Local coal is used; there is no creeping worth mentioning; and the spent charges flow—some freely if allowed, and the others on being slightly, and only slightly, provoked by the application of the rod. But here we find Mr. Townsend as approving of a slight resistance on the part of the charge, and actually applying a little restraint to those which are too impetuous; the reason being that he has a De Brouwer coke-conveyor, and the hot coke he considers is better dealt with if spread along a length of the conveyor than if it falls in one large heap. Besides this, Mr. Townsend has large retorts, which carry charges of 8 to 10 cwt., and when one of these charges falls in a mass it catches, in passing, the axle of the friction-pulleys on which the chain works at the point of exit from the house. But this question of the refusal of some of the charges to flow without some little inducement (although not objectionable in this case) is of interest. Here we have settings showing exceptionally good heats, with no visible heat passing away to the main flue, the chargers with the measuring chambers at top, and giving an equal drop to the charges in each horizontal line of retorts, with fairly uniform layers in the retorts. What then is the reason for the inactivity of some of the spent charges? It would be interesting to learn. Is it a fault in the retorts themselves? Or is it caused by a variation in the constitution of the charges? Perhaps Mr. Townsend can throw some light on the point. Upon other features of the settings, we must refer readers to the paper presented by Mr. Townsend at the meeting of the Manchester District Institution of Gas Engineers on Saturday. In that paper will also be found some information about the De Brouwer coke-conveyor, which is an imposing feature of the new works. There are many attractive points about the coke plant, not the least of which is the radial conveyor running on a gantry for the distribution of the coke in the yard. The conveyor operates silently and smoothly; and Mr. Townsend speaks of it in his paper as "working admirably," and being "much esteemed by the stokers."

We may conclude this notice of some of the interesting points relating to Wakefield gas affairs by complimenting all concerned upon the successful progress of the undertaking, the Engineer on the completeness of his works improvement scheme, and the Contractors—especially Messrs. Jonas Drake and Son, who were responsible for the inclined installation, and Messrs. W. J. Jenkins and Co., Ltd., the makers of the De Brouwer coke-conveyor—upon the character of their work, as presented to view.

THE ECONOMY OF BYE-PRODUCTS RECOVERY COKE MANUFACTURE.

A THOUGHTFUL article on the retort coke-oven, with recovery of bye-products, recently appeared in the "Engineer." It is well known that some prominent gas engineers, in England, Germany, and America, have considered this kind of coal carbonizing plant in the light of a possible accessory of towns' gas-works; and it is only necessary to refer in passing to the exhaustive writings of Dr. Schniewind on the subject which have lately appeared in the "JOURNAL." In the circumstances, therefore, it is right that an equal hearing should be afforded to all competent critics of the system; and especially is it desirable that so serious a criticism of the products-recovery coke-retort as that to which our respected contemporary has just given a most prominent place should be carefully followed. We would pause here to record the fact that many highly competent judges of coke and blast-furnace practice have never approved of bye-products recovery retort, from the point of view of the quality of the coke as compared with the best product of the beehive oven. So long as any physical difference could be truly asserted to exist between the best beehive coke and retort coke, the choice between them is held by these critics to be properly determinable only with reference to the requirements of the very best blast-furnace practice. Their position is that the blast furnace is a very costly and valuable piece of apparatus for the production of metallic iron from its ore. Beside the ruling economic condition that this appliance should always be worked at the highest possible efficiency, everything else sinks into insignificance. One of the prime necessaries of this maximum efficiency in working is the very best coke. Density, strength, and size of the pieces are the chief points of good metallurgical coke. The iron manufacturer can afford to pay the top price for these advantages; and the drop of efficiency of his blast-furnace, when these qualities are lacking to the coke, far outweighs any concession in the price that may be rendered possible by anything that can happen in the course of the manufacture of the latter. In this connection, it is worth remembering that the vast Connellsville coke region in the United States, which plays so important a part in the development of the steel industry of the country, knows nothing of the products-recovery retort. All the coke-ovens here are of the beehive pattern.

If it is conceded that the coke which is made by products-recovery retorts is inferior for metallurgical purposes to beehive coke from the same coal, then the value of the products must evidently be discounted proportionately. This point, however, has never been satisfactorily disposed of by the method of controversy. The partisans of retort coke maintain that it is equally good for metallurgical uses with beehive-oven coke made from the raw material; and their unconvinced opponents do not dispute the assertion, but go on building beehive ovens. This is the fact which remains in evidence. Besides the illustration from Connellsville already cited, the "Engineer" remarks that the progress made in England with the replacement of beehive ovens with retorts "has been but halting compared with the ideas of thorough-going supporters of the recovery oven." What is the reason for this? Apart altogether from the question of the quality of retort coke—a question which, indeed, is not raised by our contemporary—this backwardness is attributed to the unsatisfactory character of the market for the liquid residuals of the carbonization of coal in bulk.

Platform orators and newspaper writers who have no business knowledge of the residuals market, are unreliable guides on the point of the expediency of recovering these residuals in connection with the manufacture of oven coke. Indeed, it might astonish many

of the gentlemen who are accustomed to dilate upon the commercial value of chemical science, as exemplified in the now German coal-tar dye and drug industry, to be told that, so far as the interest of the coal carbonizer is concerned, the commercial value of all this chemical industry is worse than nothing. "It is all very well to talk loudly of the valuable products which are wasted in the beehive process; but it is noticeable that most of those who do so are not at all familiar with the markets for the residuals the recovery of which they so emphatically advocate." Those who are in the trade could a tale unfold which would shed a different light upon this subject. Not so many years ago, benzol, of the commercial brand known as 90's, was selling at 4s. per gallon. Its present value is about 10d., after having been down to 7d. per gallon. Considering that the industrial demand for this product for the purposes of the coal-tar colour industry has increased, and that a good deal of it is being used for enriching coal gas, the "Engineer" concludes that the reason for its weakness in price is over-production. If it is strictly true that benzol is a drug in the market, as has been reputed of it for some time past, then the chance of coke-oven producers recouping themselves for their outlay on this account is rather remote—that is, unless there should arise a greatly increased demand for benzol in the gas industry; but that is "another story," to be dealt with later.

Of course, benzol is not the only marketable product of coal tar. There is carbolic acid, for instance, which the demand for disinfectants and explosives has kept up well in price, and continues to do so, although the market has weakened somewhat of late. Still, a coal-carbonizing plant cannot be run entirely on carbolic acid. As to anthracene, the tale is one of bitter disillusionment. What has the much-vaunted discovery of artificial madder done for this coal-tar product? Those who would advocate the recovery of any more of this disappointing product, in face of the market reports, must be curiously constituted. The trade in these coal-tar products is of an exceedingly complex character; and it is impossible to penetrate beneath the surface of quotations in an article. The "Engineer" refuses to go into the details, but proceeds straight to the main question of whether, considering all things, it is worth while for capitalists to spend more money upon the recovery of tar? The query is answered in the negative.

This disposes for the time being of the question of tar. With regard to the allied question, of the expediency of recovering ammonia from carbonized coal—a subject which has come forward prominently in connection with the Mond gas idea—it is remarked that the outlook is not at all so black, because the price keeps up, and the demand is certainly likely to increase. "Mond gas plants will, however, add largely to the output in the future, and thus have an effect upon the coke-oven production, the extent of which it is impossible to foresee." The same observation applies to the gas-works production of the salt. Here, in a somewhat disconcerting fashion, the writer in the "Engineer" abandons the direct path of his reflections, and harks back to benzol, and the phenolic products, in an attempt to answer the question of whether beehive ovens could be profitably fitted for the recovery of their waste products. This he finds to be in the main impracticable. Certainly, something of the kind could be done; but it would not be worth doing. Consequently, it pays the owner of beehive ovens better to let his waste go than to incur the necessary outlay for recovering it. The writer thinks that benzol may come into increased use for the enrichment of gas for lighting purposes, when the case might be altered, and it might become worth while to wash the benzol out of beehive oven gas, even if the accompanying tar were left untreated. He is not oblivious, however, of the "somewhat sinister fact," that, owing to the increasing popularity of incandescent gas lighting, "for which purpose there is nothing to be gained by making a gas of high illuminating power," the employment of benzol and other enrichers may conceivably go out of fashion altogether.

All these considerations reflect upon the issue of whether it is really worth while to embark upon products-recovery in connection with the manufacture of metallurgical coke. This writer evidently thinks it is not. He admits that an important part in the business of products recovery is the disposal of the tar. It is not every colliery that cares to encumber itself with a full-blown chemical works; and where the tar has to be sent away to the distillers, this introduces another factor into the economical problem. Some tars will stand the cost of carriage to a distance, while others will not. The conclusion of the whole matter is that, having regard to the ups and downs of chemical industry, which afford an insecure foundation for allied enterprises, and particularly with regard to imminent developments of the gas industry already mentioned, the advocacy for an enlarged production of tar is seriously disparaged by adverse significant facts.

It will be noticed by gas engineers that this view of the situation of tar as a manufactured product does not affect the question of whether a modified retort-oven practice might prove an advantageous innovation upon the established methods of gas manufacture. It leaves the problem, however, controlled by the factors of coke and gas production. The manufacturers of coal gas will not be sorry to learn that their troubles with tar are not likely to be aggravated by a rapid extension of products-recovery coke-ovens, either in this country or abroad. The depreciation of the value of tar products is a sufficient guarantee of this relief; while in regard to sulphate, gas manufacturers will probably defer troubling themselves in respect to the influence of the Mond output of this residual, until it appears in the market in considerable quantity.

THE VIENNA MUNICIPAL GAS-WORKS.

(*Continued from p.* 1373.)

Gasholders and Gasholder Houses.

The original plans of Herr Herrman for these gas-works included the erection of four enclosed gasholders, each of about 3,200,000 cubic feet capacity, closely adjacent to one another. Two out of three advising experts supported these plans, except that they recommended a greater distance between the holders than Herr Herrman had proposed. But, as it was of the utmost importance to start the work of construction without delay, his plans were adopted without modification, except that the holders have been erected in pairs, with a considerable space between the pairs, instead of all standing at equal intervals in a row. The four large works' mains have been carried through the intervening space between the pairs to the governor-house.

In the construction of these huge and conspicuous holders, it was considered necessary to make them architecturally as little offensive as might be to the artistic sense of the people. For the sake of speed in their construction and of economy, stonework was employed only where unavoidable. The mouldings were chiefly carried out by Monier work; and even the resting blocks in the tank for the bell of the gasholder were of concrete. The water in the tanks was to stand over 26 feet above the raised level of the works; and fears were openly expressed that it would be impossible to ensure the soundness of the tanks, especially as the contractors for the work refused to guarantee it in this respect, in view of the short time at their disposal. As the area of the tanks was about 33,300 square feet, and they each held 6,600,000 gallons of water, the filling of them was freely stated to be attended with great risk to the neighbourhood. Fortunately, these fears all proved to be groundless, thanks to the care exercised in the design and execution of the work.

The internal diameter of each tank, and of the gasholder house erected thereon, is 206 feet. The walls of the tanks are 39 ft. 4½ in. high, and are of brickwork. Ordinary hand-moulded bricks and Portland cement mortar were used. The foundations of the walls, the bottom of the tank, and the bed of the wells for the inlet and outlet mains were made in concrete (see Plate II.). The bottom of the tank is horizontal for a width of 9 ft. 10 in. from the walls; and in this ring there are 54 resting stones for the bell, formed of concrete and iron. The upper surface of the rest of the tank bottom is dome-shaped, with a rise of 8 ft. 6 in. The under surface of the tank floor is, however, made in horizontal steps, in order to avoid any lateral thrust on the wall of the tank. The lining of the tank floor is 5 ft. 3 in. thick in its thinnest parts. The walls and the floor of the tank are made water-tight by means of a rendering of carefully ground Portland cement mortar 1·2 inches thick. The foundation of the tank walls is 5 ft. 7 in. deep. The concreting was executed in three stages—viz., first the foundation of the tank walls for a width of 25 feet; second, the dome of the tank floor; and, lastly, after the house had been finished, the remainder of the tank floor between the walls and the dome. The tank walls are 17 ft. 8½ in. thick at the bottom, and diminish by nine sets-off to 5 ft. 3 in. at the top. They are strengthened by four sets of polygonal bands of flat iron, ¾ inch by 2·6 inches.

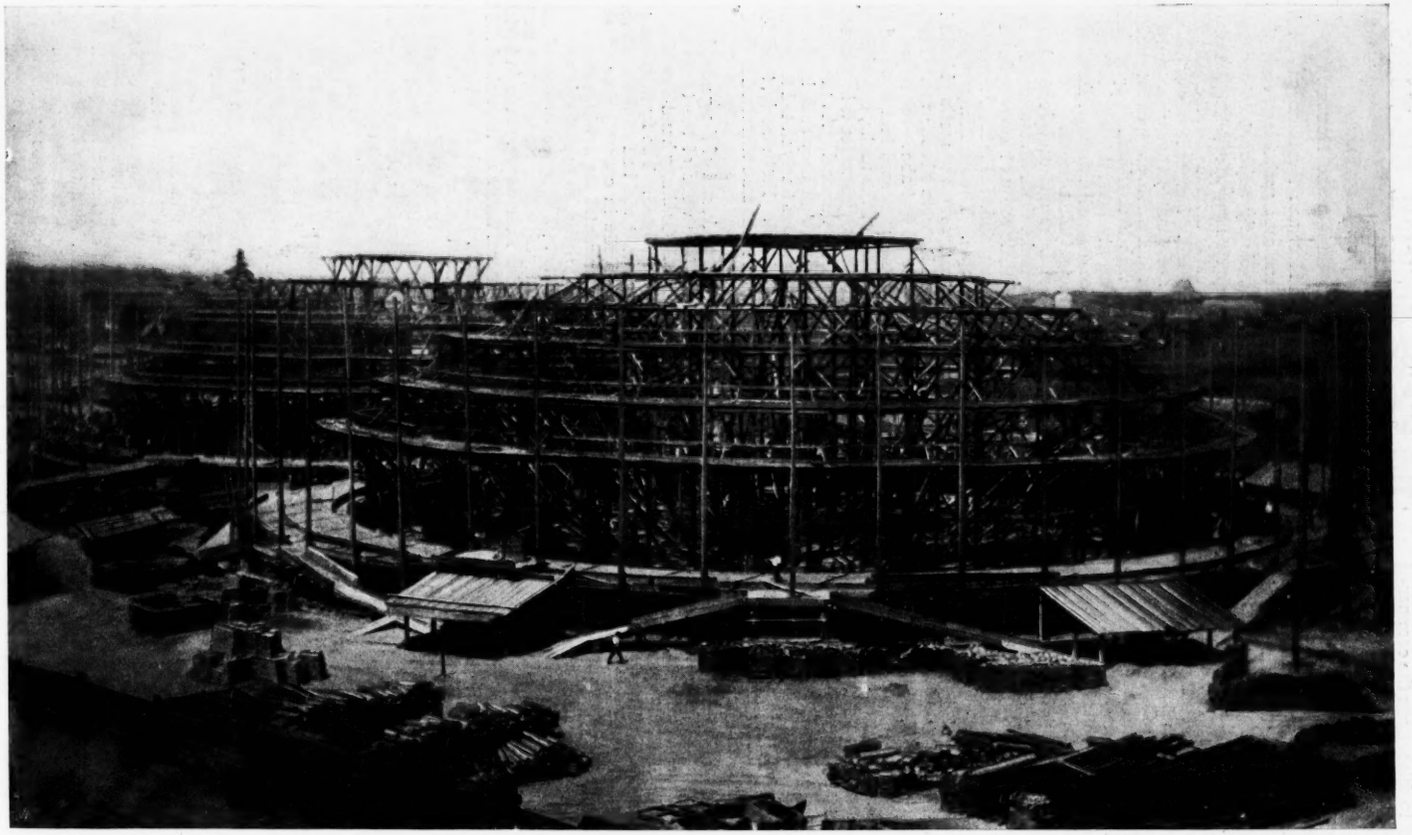
The site of the gas-works lies on a former basin of the Danube, which, in the course of centuries, washed trenches out in the marl, and afterwards re-filled them with different kinds of materials. Hence there is no uniformity in the subsoil. Compared with the rest of the works, however, the holders, with the exception of No. 2 at one spot, had relatively good subsoil, as on top of the marl there was a firm bed of grey gravel and sand. The foundations were therefore only carried deep enough to give a firm bed of ballast at least 6 ft. 6 in. thick from the highest level of the marl. The mean depth of the excavations was therefore 17 feet, and at the wells for the inlet and outlet mains 31 ft. 6 in. Though these depths allowed a good deal of the work to be done in the dry, yet extraordinary difficulty was found in getting the best of the water, especially in the wells for the mains. Great care was taken to avoid the withdrawal of fine sand with the water. Herr Herrmann had proposed to employ an extensive system of piles in order to secure a firm foundation; but this scheme was abandoned in favour of one of bedding in the lower part of the 5 ft. 7 in. thick concrete foundation, and of the adjoining horizontal part of the tank floor, two crossed sets of I-shaped girders, 5⅛ inches deep. The tanks were carefully examined in the short time intervening before the erection of the houses was started, with very satisfactory results. It was found that one tank could be emptied without affecting the two adjacent ones.

The walls of the gasholder building above the tank are made with ordinary bricks and Roman cement mortar; and the brickwork is left uncovered, except where there are sloping surfaces, as on the cornices, doorways, and columns. These surfaces are covered with green glazed roofing tiles. On the ground floor, the superstructure is interspersed with bands of plaster, which are also inserted in the upper floor above and below the windows. The topmost floor is rendered attractive by pilasters and semi-cylindrical arches, above which is a massive principal cornice, with an attic railing and finishing columns.

The guide columns for the bell (see figs. 9 to 25, Plate II.) and the roof supports tally with the eighteen columns on the face of the building; and there are five galleries inside corresponding

with the position of the fully extended three-lift bell of the gasholder. On the outside, the storeys formed by these galleries are distinguishable by the large windows. Inside the house is an iron staircase, by which the holder may be reached. No provision is made for going up the walls of the houses from outside, except where the two houses of each pair approach nearest to one another, at which point they are joined by a bridge, to which means of access are provided. The walls of the gasholder houses are 5 ft. 4 in. thick at the basement or footing, 4 ft. 5 in. at the ground floor, 3 ft. 5 in. at the first and second stories, and 3 ft. at the topmost story. The roof supports are nearly 152 feet above the level of the ground, after it had been raised as already stated. The apex of the lantern of each roof is 221 feet above that level, and consequently more than 226 feet above the level of the land in the vicinity.

The bracket supports for the guides of the gasholder were made by building out the brickwork of the house walls, by which plan an internal bond of masonry was obtained. This method of procedure did not give rise to appreciable error in the erection of the guide rails. The cupola-shaped roof of the holder is supported by an iron framing constructed on the Schwedler system (see Plate II.). The cross section of the dome is a segment of a circle, 142 ft. 9 in. radius; and the rise amounts to 43 ft. 9 in. A parabolic shape of dome was rejected on æsthetic grounds. The roof is constructed of 36 radial girders from 8 to 11 inches deep, and of seven rings set at distances of 15 ft. 11 in. apart. The rings are not made up as regular curves, but as polygons, in order to avoid risks of distortion; and diagonal ties are placed across the girders and rings. The inmost ring, under compression, has a diameter of 42 ft. 8 in.; while the diameter of the bottom ring, which is in tension and is formed of flat iron, is 208 ft. 8 in. On top of the pressure ring rests the wall of the lantern, 15 ft. 5 in. high, and provided with windows and a dome shaped roof having a height of 8 ft. 6 in. The roof is covered with wood and sheet zinc roofing. The calculations for the roof were based on a maximum load of snow of 15·36 lbs. per square foot of horizontal projection, and a maximum wind pressure of 30·72 lbs.



Timber Framing to Support the Gasholder Roof.

In order to gain access readily to the interior of the roof, a travelling staircase is provided for each gasholder. Its sides have the same radius as the roof girders, and one end of it is carried on a pivot in the middle of the roof; while the other rests on a carriage, which can be moved round on rails on the outside of the topmost gallery (see fig. 36, Plate II.). Thus any part of the interior of the roof can be at once reached for inspection or repairs. On the exterior, the usual stairs and circular gangways are provided. The roofs were actually put to an unusually severe test during the first year that the holders were at work, for a heavy fall of snow caused it to settle on parts of the roofs to a depth of nearly 20 feet. But no evil effects could be detected.

The tanks of one pair of holders were first finished, and then while the roofs of these were being erected, the tanks of the second pair were made. By this arrangement of the work, two framings for erecting the roofs were saved. The roofs were raised by means of screws while the walls of the gasholder houses were being built. The large dimensions of the holders and the great depth of the tanks rendered very extensive framings necessary for the erection of the roofs. One of these framings is seen in fig. 1, Plate II., and in the above photographic reproduction. The highest floor of the framing was 73 ft. 6 in. above ground level. The framing took from four to six weeks to erect; while the construction of the roof itself only required, on an average, 29 days. The weight of the roof structure is 143 metric tons. For raising each roof while the walls were being erected, there were employed 36 external screw spindles nearly 4 feet in length. These screwed into the bottom ring of the roof opposite the ends of the rafters (see figs. 35 and 35a, Plate II.).

Directly above the foot of the screw spindle, and attached to it by cottar pins, was the socket or collar in which the levers for raising the roof were inserted. On each side of each screw, and 39 inches apart, centre to centre, were attached to the angle-iron of the outer ring of the roof two wooden blocks $27\frac{1}{2}$ in. long and $13\frac{3}{4}$ in. high. The procedure followed in raising the roof was for one of the workmen at a given signal to turn the lever, inserted

horizontally in the collar already referred to, through an angle of 90°, and in this manner to lift the roof gradually about 40 inches. One of the blocks attached to the outer ring was then propped up by a number of wooden blocks, and the weight of the roof thus taken off the screw, the foot of which was then raised to a higher position. In the space thus gained, the wall was then built up round the supporting column of wooden blocks; and finally the second wooden block on the outer ring of the roof was provisionally used to support it on the newly erected portion of the wall. The first column of wood could then be removed and the gap left for it in the wall filled up. The screw could then be set up again on the fresh masonry of the wall, and the roof again lifted by about 40 inches.

The work of raising the roofs had, of course, to be most carefully supervised, and constant care taken that they were in their proper positions. No evil results ensued through want of uniformity in the lifting process, as had been feared at the outset. In calculating the dimensions of the outer ring of the roof, regard had, however, been paid to the strain which would be put on it by the raising process. Lightning conductors were fixed at the time the roofs were being erected; and actually during the construction of the holders several discharges were conducted away without doing any injury to the structure.

The way in which the preliminary work had been hastened on enabled the first sod for the holders to be turned on Dec. 28, 1896; and the contract for the ironwork of their roofs to be placed on the following day. The four holder houses were to be completed by July 1, 1898; but premiums were offered by the Municipality for their completion by an earlier date—amounting to as much as £1670 for completion by May 15, 1898, and less sums for a fortnight and a month later. Actually the building work on one of the two pairs of holders was finished by May 10, 1898, and that on the other pair by the contract time. The brickwork and masonry of the walls of one pair were actually carried out, including raising the roof, in 84 days, and of the other pair in 72 days. The conditions of weather at the time were favourable to the work; but the great speed with which it was carried out is said to have been in no small degree due to the enthusiasm of all concerned for it. During the busiest week, the number of workmen employed each day on the construction of the holders averaged 1590.

In order to support the tank walls against the considerable pressure of water, the customary embankment round about the tank was made of well-rammed ballast, free from sand, which was obtainable at a reasonable distance from the site. But unfortunately the large quantity of material—viz., 82,500 cubic yards of ballast, and 11,800 cubic yards of mould, necessary to raise the cone to the required height of 26 ft. 3 in., had to be brought to the spot by the tedious method of carting, as, owing to a number of circumstances, it was impossible to utilize mechanical means of transport, or even tramway metals. Concrete was used in the narrow strip between the tanks of two adjacent holders.

The inlet and outlet mains of the gasholders are 48 inches in diameter. Those for each pair enter a special house, in which are the valves, pumps, &c.

Each of the four gasholders has a capacity of 3,178,500 cubic feet; and hence the four provide storage for 12,714,000 cubic feet. On the basis of a maximum daily make of 15¼ millions, for which the present plant of the works is designed, the storage would amount to 83·3 per cent. of the maximum daily make. Even with the extension of the plant for a maximum output of 17½ million cubic feet, the holders would still be equal to storing 72 per cent. of the maximum make per diem.

The original scheme of Herr Herrmann comprised the construction of trussed crowns to the gasholders. The central kingpost of the trussed roof was to rest on a pier of masonry when the holder was in its lowest position. But the great object which characterized the erection of the Vienna Gas-Works—viz., the saving of time on the work—precluded the Constructing Engineers spending time on studying a special scheme of gasholder construction; and therefore the firms tendering for the work were left with a free hand to offer their own designs. Ultimately, the tender of a Vienna firm (Messrs. Gridl) for the four gasholders was accepted; but no fewer than five firms were employed by them on the work under sub-contracts.

Their scheme embodied the use of a self-supporting crown, without any extraneous support for the ribs when the bell was in its lowest position. The chief proportions of the holders are shown diagrammatically on Plate II. Each is in three lifts. The inner lift, or bell proper, has a diameter of 190 ft. 10 in.; while the second and outer lifts are 193 ft. 11 in. and 196 ft. 10 in. in diameter respectively. The crown of the bell is of spherical section, with a radius of 305 feet, and a rise of 15 feet 1 in. Each lift is 38 ft. 0½ in. in height; so that the holder, when fully extended, has a height of 110 ft. 3 in. It was stipulated that the fully-extended holder should throw a pressure of 8·3 inches of water; the inner and second lifts 6·7 inches; and the inner lift alone 4·9 inches. The calculations were based on a maximum pressure of 8·4 inches of water, which is equivalent to a total pressure of 578 metric tons on the roof of the bell, or of 43·6 lbs. per square foot of its surface.

The crown of the bell is constructed of girders similar to the roofs of the gasholder houses. The angle-ring, or curb, where the crown meets the side sheets, is attached to 54 girders or ribs, which are divided into nine sections by eight intermediate rings. The rib girders are made throughout of rolled I-joists, 7·9 inches deep. A stiff triangular bonding is obtained by means of diagonals inserted between the ribs and the rings. The skin or sheets lie unfastened on the framing of the crown when the holder is grounded; being attached to it only at the curb and at the centre of the dome. Thus the pressure of gas within lifts the skin of the crown independently of its framing. The skin consists of plates 0·13 inch thick, except that the outer row attached to the curb are ¼ inch thick, and that at the apex of the crown plates from ⅛ to ¼ inch thick are used. All the rings of the roof-framing except the sixth consist of two rows of U-iron, 3·9 inches deep, rivetted to one another. The sixth ring, at which each alternate rib terminates, is stronger. It consists of two rows of U-iron, 11½ in. deep, and 3 in. wide, rivetted together. The diagonals are of angle iron, except in the topmost ring, where they are of flat iron. The different parts of the roof framing are joined at the places where they cross by means of wing plates. There are three manholes on the crown. Two are over the inlet and outlet mains, and are of the well-known type which admits of these mains being reached for cleaning purposes without the holder being completely emptied of gas.

The angle-ring or curb consists of a vertical plate, 21½ in. deep and ½ inch (full) thick, to which are attached two angle-irons, 6·3 in. by 6·3 in. by 0·75 in., and a plate 26·3 in. wide and ½ inch (full) thick, which is at first horizontal, but is then bent obliquely. Next to this plate comes the ¼ inch thick row of plates forming the transition row to the ordinary 0·13 inch plates of the crown.

The rafters of the roof, the framing of the sides of the bell, and the curb are also fastened to one another by strong fish-plates and brackets, so that these parts of the structure can securely carry the weight of the two lower lifts and cups, which depends on them and amounts to 300 metric tons. The sides of the inner lift or bell consist of a framing of 54 double T uprights, 7·9 in. deep. These uprights are stiffened and supported by two horizontal polygons of iron. The guides for the bell are put on its outside opposite eighteen of the angles of the polygon, so that the pressures which arise in guiding the bell are transmitted directly to the framing of the bell. Flat diagonals connect the horizontal and vertical members of the framing of the sides of the bell. The bottom of this framing is formed on the inside of angle-iron, and on the outside by the ring-shaped cup, which is similar in construction to the cups and dips of the other lifts. The top and bottom rows of plates are ¼ inch thick; the intermediate ones ⅛ inch thick. All the cups and dips of the holder are 23½ in. deep, and consist of U-iron, 10¼ inches wide, placed horizontally, to which vertical plates, 23½ in. high and ¼ inch thick, are attached. Their edges are stiffened by flat iron rivetted to them. The quantity of water required to fill each cup is 5280 gallons.

The framing of the middle and outer lifts consists of eighteen principal and thirty-six intermediate vertical stays, which are stiffened at half their height by being tied together by a polygon of U-iron, 5½ inches deep. The eighteen principal vertical stays, which correspond with the eighteen guides, are formed of two lengths of U-iron, 5½ in. deep, which are riveted at a distance of 5½ in. from one another, and fastened to the side sheets, by means of a plate 17¼ in. wide and ¼ inch thick. The intermediate stays are formed of 5½ inch deep double T-girders. The side sheets are $\frac{1}{16}$ inch thick, except the top and bottom rows of each lift, which are ¼ inch thick. Two manholes, with lids to unscrew, are provided in the sides of each lift, a little above its bottom. The joints are made tight with an insertion of jute saturated with red lead. The weights of the structure of the middle and outer lifts are 113 and 116 metric tons respectively.

The bell and lower lifts are guided on eighteen vertical rails, by tangential rollers only. The eighteen guide columns of each gasholder house are constructed as lattice standard (see Plate II.), having the angles of angle-iron, 3·15 in. by 3·15 in. and $\frac{5}{16}$ inch thick. The guide columns rest on strong brackets, which were built in the walls of the tank during its construction. They are strong enough to support the bell and lower lifts during erection or reconstruction. Besides taking the pressure of the guide rollers, the lattice standards have also to support the five galleries, which run round the interior of each house. Secondary supports for these galleries are, however, inserted in the masonry of the walls of the house.

The guide-rollers, with the exception of those at the top of the inner lift, are all flanged. The pins of the rollers are of steel. The guides consist throughout of planed double T-iron, 7 in. deep, riveted to the framing of the bell or lower lifts opposite the principal stays of the sides of the holder.

Ten months were allowed for the erection of one of the holders. Actually, the bell and guides of Nos. 1 and 2 holders were commenced on August 2, 1898, and finished on the 16th and 2nd of April 1899, respectively; while those of Nos. 3 and 4 were commenced on June 29, 1898, and were finished on February 12 and January 29, 1899, respectively. The weight of one holder is about 600 metric tons; while the house-guides, galleries, staircases, and railings make up a further 175½ metric tons. The weight of the iron used in the holder, guides, galleries, staircases, and railings amounts to 5·37 lbs. per 1000 cubic feet of holder capacity, of which 4·18 lbs. is for the holder alone. The cost of the iron structure works out at 1s. 5¼d. per 1000 cubic feet capacity, of which the cost of the holder proper amounts to 1s. 1½d.

Directly the smooth concrete bottom was finished, it was covered with a layer of sand 6 inches deep as a protection, and the scaffolding for the construction of the bell of the holder was set up. This is shown in fig. 2, Plate II. After the erection of

a holder had been finished, the work of drawing out the sand and of repairing the cracks, which had appeared as three concentric circles in the bottom of the tank of all four holders, could be commenced.

In order to fill up the fine cracks on the bottom of the tank, it was covered with a layer of white lime mortar 0·4 inch thick, and then the filling of the tank with water was begun. For filling the four tanks 26,400,000 gallons of water were required; and the greater part of this quantity was pumped from two wells, sunk on the gas-works land, by means of Worthington pumps. By this plan, a trial was at the same time made of the productive capacity of the wells. A small quantity of water only was taken from the deep well water service. In order to counteract the attacks of the free carbonic acid in the shallow well water on the rendering of the bottom of the tank, and in order to fill up fine cracks in the rendering of the walls, white lime was added at fixed intervals during the filling of the tank. The filling of the tanks occupied 35 days, and the pumping was finished on May 31, 1899. In the intervals, exact observations were made as to the soundness of the tanks. The results were awaited with much interest and some anxiety by the Engineers; but they proved to be extremely favourable. As soon as the tanks were filled, the holders were each filled with air and emptied four times, in order to test them for soundness and proper working. These trials were finished on July 17, 1899, when all the holders were ready for use.

(To be continued.)

REGULATION OF STREET LAMPS AND SIGNS.

It is not at all unlikely that the new bye-laws relating to the height from the pavement of shop-blinds, outside lights, and similar attachments to business premises, which the London County Council have under consideration, may work a great alteration in the conditions of the trade in outside and inside gas shop-lamps. The general nature of the proposed regulations appears in the notice of the action taken by the London Chamber of Commerce in the matter, which was given in the "Journal" for the 19th ult. (p. 1336). The Chamber have recognized that the question is one of great practical moment for shopkeepers, as well as for the considerable trading interest concerned in the manufacture, supply, and fixing of shop-lamps. It is understood that, now the matter of these outside shop-fittings has been taken in hand, it will not be dropped until a settlement is effected which will prove workable by the local authorities and acceptable to the other parties to the question. This subject of shop attachments, sunblinds, lamps, and so forth, is of extreme interest and importance in connection with the commerce and aspect of streets. Every nation, and latitude, has its own natural and proper tastes and requirements in this regard. Without enlarging upon this most tempting topic, on which almost every observant traveller could write a volume, it will suffice for present purposes to remark that the London fashion in these matters is, broadly speaking, that of the whole country. And, to put it briefly, the fashion of London shops runs more to show lamps than to any other kind of sign. We have only to do here with this branch of the subject.

The short point of the new regulations is that nothing of the nature of an overhanging obstruction to the traffic of the footpaths of the streets of London shall be permitted to come lower than 8 ft. 6 in. above the pavement level. In the City, to which the ordinance would not apply, the regulation height of sunblinds, &c., is 7 ft. 6 in. This height, it should be said at once, is insufficient for a crowd of English people, of the average height, carrying umbrellas. It is quite true, as some newspaper apologists for the shopkeeping interest aver, that a headroom of 6 ft. 6 in. is high enough for the average "man in the street," top-hat included; but that is not the proper standard to select for the purpose of this measurement. Put an umbrella in the hand of the average man, or a sunshade in that of the tall woman who is becoming more plentiful with every successive generation, and this amount of clearance is not enough. Require two persons so equipped to pass one another in the narrow streets of London, and it at once becomes apparent that the new limit of height proposed by the London County Council is not an inch too much for the lower edges of sunblinds, and for structures projecting horizontally over the footway.

With regard to outside shop-lamps, the case is different. These lamps fall into two categories, which ought to be discussed separately. One will contain all display lights of every kind which are intended to show themselves off, as well as to render attractively brilliant their immediate environment. Of such is the huge and gorgeous lantern which is the approved modern substitute for the legendary "bush" of the innkeeper. The other class comprises the modest hanging lantern which is designed to shed the whole of its radiancy upon the contents of the shop-window, remaining itself in unregarded obscurity. This is a peculiarly British invention. In no other country do the shopkeepers indulge in so much of this kind of auxiliary lighting for their show-windows as the English. Whether the reason is climatic or otherwise, the fact remains. Of late years there has been a tendency to increase this variety of shop lighting. The old moveable reflector lanterns with their argand gas-burners, which the shop-porter put out at lighting-up time and took in when he wanted to put up, or draw down, the shutters, have given place to a hideous make of fixtures called "arc" lamps by the British tradesman—heedless of the niceties of language, so long as there is something to sell by a taking name. The new-fashioned heavy lanterns, made to contain a pair of incandescent gas-burners, come perilously near to being a hybrid between the inoffensive reflector lantern and the display lantern of a different class; and as such, they do not commend themselves to the judicious. Even these, however, are outranked by the large 500-candle incandescent electric lamps, which, naked and unashamed, glare in the eyes of the wayfarer opposite many a cheap haberdashery store. These last outrages "give the show away." Some regulation will have to be applied to them. We say this, not because of their being electric lights. The objection would be precisely the same if they were incandescent gas-lights. The point is that they are too low, and too much exposed, to be forgiven by those who hold that shopkeepers' display advertisements must be subordinated to the interest of the public. It is an improper use of a light of blinding intensity, to hang it in rows in front of a shop-window, unscreened in any direction.

All these matters must come within the scope of the new regulations. The existing outside lamps will have a period of grace allowed, after which they must either conform to the regulations or be removed. This eventuality is present to the minds of shopkeepers, some of whom have poured their reflections on the question into the sympathetic ears of newspaper reporters. Where the retail shopkeeper, and more especially the publican, scores in opposition to the proposed ordinance, is in his perfectly true contention that the outside lighting in which he indulges for his own purposes very materially assists in the general illumination of the street during his business hours, and that the wayfaring public will miss his lamps when they are gone. This argument is particularly valid for those belated districts of London where the local authority have remained unaffected by the fashion of improved public lighting, as in Holborn. Some of the shopkeepers who complain contend that, consistently with public safety, they ought to be allowed to illuminate the interior of their premises as they please. The point is well taken; but it can scarcely be successfully contended that the use of unscreened electric lamps of 500-candle power or thereabout, at heights a little above the level of a wayfarer's eye, satisfies the condition precedent. There is unquestionably something in the criticism of some other shopkeepers, that it almost looks as if it had been the intention of the framers of the new regulations to encourage the more general lighting of shops from the interior. As to this, it might be replied that, if so, the intention is not an unjustifiable one.

For various reasons, the device of lighting a shop-front by outside reflecting lanterns is not to be admired. Neither is it altogether beneficial to the shopkeeper. It is supposed to be necessitated by the practice, common to the more vulgar sort of tradesmen, of plastering their wares against the plane of the window, so that no interior lights can strike upon them. This is, after all, a very coarse and barbaric style of window-dressing, which sacrifices the charm of perspective, and never induces a passer-by to stay and give the wares a second glance. It would not really hurt shopkeepers if all outside reflector lighting of shop-windows were forbidden by law; as it is impracticable for climatic reason in most latitudes. British shopkeepers, however, are not as a rule artists. We cannot properly claim to be an artistic race; and certainly our tradespeople are usually among the Philistines. There are exceptions, of course; and they are not the least prosperous of their order, for the British public appreciates prettiness where it is to be seen.

As regards shop lighting, suitable treatment of the subject is rare. The British shopman does not use light with sufficient freedom, and does not know where to put it. Given a shop-window where there is anything to look into—that is to say, where the value of a perspective view is understood—the proper place for the lights is overhead. In paternally-governed Germany, no dealer in inflammable articles is permitted to put a light among them; and the result of this restriction is that the gas-burners, fitted with top-reflectors, are massed above the goods, with excellent effect. A jeweller's window, of course, has to be enclosed on all sides, and on top, as a show-case. There can be no comparison of effect between the flood of overhead light showered upon such glittering wares, and reflection from lamps outside. The same remark applies to almost every description of display goods. The sole essential is that the light shall be adequate. This is not properly understood in England. One sees a shop-window lit up from within by half-a-dozen incandescent gas-burners, placed above the line of sight; and it has a fairly bright aspect. Double the number would not be too many; and then the electric incandescent lamp would look, in comparison, like a recently blown-out wood match. British shopkeepers have never appreciated, like their Continental rivals, the commercial value of bright lighting. Bond Street is but a dingy tunnel compared with the Rue de la Paix.

The indirect benefit to be expected from the new regulations is that shopkeepers who have hitherto neglected to study the advantages of interior lighting, either as an alternative or as accessory to outside reflector lighting by the means of "arc" or any other lamps, will be induced to do so in their own interest. This should give the gas-fitters their opportunity. The best shop gas-fittings rarely need to be of an elaborate or costly character, because nobody wants to look at them, but only to see other objects by the light they provide. With the most brilliant and

the cheapest light in existence at their command, gas-fitting firms must be backward indeed if they cannot turn the impending new order to good account. There will still be any amount of display outside lighting, of course; but the limitations of height will put most outdoor lamps out of service for shop purposes, while leaving to this class of lantern the privilege of supplementing the niggardly public street lighting.

ELECTRIC LIGHTING MEMORANDA.

The Character of a Telephone Exchange System—Prudence of the Post Office—Electricity Needing to be Saved from its Friends —Mr. Wordingham on Electrolysis.

WE explained in an article that was published in last week's "JOURNAL," that a telephone exchange system has in its financial relations a highly important and interesting lesson for those who are engaged in the conduct of other public supply services. It is almost singular in being an undertaking which becomes more expensive to work as the scale of its operations is extended. As was to be expected, the announcement of the terms for the new London Post Office telephone service has been the overshadowing incident of the day in many circles. Also, as expected, those public men in the Metropolitan local governments who are politicians first, whatever they may be afterwards, have gleefully pounced upon what struck them as a promising opportunity for abusing the present Cabinet. The public generally have been disappointed with the offered rates, and are mystified as to where the expected "competition" of the two services comes in, seeing that the prices are about the same. Hence the political cry of "betrayal," and so forth, which is raised in certain quarters. It is our opinion that, as experience grows, the wiseacres of the London County Council and the City Corporation, who arrogate to themselves competence to judge Lord Londonderry and his advisers in this extremely intricate matter, will look foolish later on. An electrical undertaking is not a thing to embark upon without much consideration; and especially is it not to be underpriced at the start.

It seems to have escaped the Benns and Mortons and other repositories of all the Arts and Sciences whom popular election is so wonderfully apt to discover in an undistinguished multitude, that an exchange telephone service, like many other things, must have a beginning. Doubtless, the incurious public would have been delighted if every house in London could have had an offer of telephonic communication with every other for £1 or so a year. But what a mountain of difficulty that would have raised in the way of any efficient organization of the Government service within a reasonable time! How every such subscriber would have complained in his favourite newspaper if there had been the slightest hitch in getting him connected and satisfactorily served! As it is, when once a beginning has been made, improvements and extensions can be waited for with confidence. Eventually, both the services will be amalgamated; and then the value of an interlude of comparison of performance will become public property. And inasmuch as the Post Office will only require the lowest known rate of remuneration for the capital employed, the public will be as well served in the end as can be arranged in any respect.

There is no industry of modern times that has needed so much protection from its own friends as the electrical. Every passing phase of the commercial application of electricity to the practical needs of British communities has been puffed and belauded by the Press and on the platform; every reasonable objection to the instant satisfaction of the aspirations of those who happened to be concerned in the pushing of electrical ventures has been persistently howled down. Time was when ordinary citizens who ventured to point out that sputtering arc lights stuck upon posts joined together by festoons of wire did not improve the streets of English cities, were roundly abused for their pains. At yet another stage, anyone who withstood the establishment at the expense of the rates of as many petty little electric lighting concerns as "Consulting Electricians" wished to plant out in unsophisticated hamlets, was accused of hindering "progress." And lastly, those proprietors of gas and water mains in highways who desired protection for their property against the electrolytic effects of stray currents from electric traction systems, have not only been put to considerable expense in making the endeavour, but are ridiculed for their fears.

It is surely time that this irritating trick was dropped. In the course of his inaugural address as President of the Manchester Section of the Institution of Electrical Engineers,* Mr. C. H. Wordingham took the opportunity for boldly protesting against the foolishness and temerity of those "who vociferate that there is no danger, and urge on traction companies to what might be ultimate ruin." Mr. Wordingham, in his former capacity of Electrical Engineer to the Manchester Corporation, had experience of both aspects of the question of electrolysis of gas and water mains; and he does not make light of the danger. He admits, on the contrary, that it is a very real and may be a very serious matter. Here are pipes put into the ground at great expense to subserve certain purposes, which have received statutory sanction. To them comes a new thing, which offers a different kind of service to the same public, and therefore has precisely the same justification for its existence; and certain people put forward the claim that, so long as certain arbitrary rules and regulations are observed, the new comer shall be held absolved from all responsibility for what may happen to the pipes by reason of its presence. Mr. Wordingham does not agree with this contention.

What he says is, on the contrary, that, while the electric traction companies ought to be allowed to start in business and carry it on in the manner sanctioned by the Board of Trade, if they do any damage they should be answerable for it. This we understand to be the position of the owners of gas and water pipes. The only disputed point is as to the nature of the proof to be given of the damage done. The electric traction interests have insisted on proof positive being supplied, not merely of electrolysis, but also that it was traceable to their electricity. This is objected to by the other side as being an impracticable requirement; seeing that waste electricity is as apparently unaccountable as the wind. Mr. Wordingham is firm in holding to the broad issue, that electrolysis ought, as far as possible, to be prevented, not left to be fought over after it has come about. "In this controversy," he remarks, "the disastrous effect to electric traction generally that would arise from a wholesale destruction of gas and water pipes, if such destruction should take place, seems to be lost sight of." He thinks that it is doing the cause good service to point out this risk, in order that it may be avoided by requiring traction to be worked at a much lower limit of potential than that at present allowed by the Board of Trade. This, he avers, is quite easy of accomplishment.

* See last week's "JOURNAL," p. 1374.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 1475.)

BUSINESS on the Stock Exchange last week was somewhat fluctuating in its tendency. At times it was depressed, and at other times it became tolerably cheerful; but on the whole the worse tone prevailed. There was an uncomfortable feeling in the Railway Market in regard to competitive lines, heavier outlay, and reduced returns. And the upset in copper touched a good many quarters—even the buoyant American Railway Department not escaping. So, taking things all round, prices came out worse at the finish than at the start, though the closing marks were better than the lowest of the week. The Money Market was a good deal stiffer, owing to a brisk demand in connection with the fortnightly settlement on the Stock Exchange and other purposes. The Gas Market had quite a calm last week, as compared with the average run of the last month or so. Transactions were emphatically limited, and almost entirely devoid of interest. The consequence of this was a tendency to slight weakness in some quarters for lack of support, especially where it reacted on recently buoyant prices. However, all told, the actual effects amount to next to nothing; for there were hardly any changes made in quotation, and these were of very slight proportions. In Gaslight issues, the ordinary was lightly dealt in. It opened at par, but never touched that figure again; and on Friday it was done at 99. The secured issues were very quiet at about middle prices. A bargain or two was marked every day in South Metropolitan, at very level figures, which showed no disposition to improve or recede. A single transaction in the old stock was noted in Commercials. Hardly a transaction was done in the Suburban and Provincial group; and no changes in quotations were made. In the Continental Companies business was mainly in Imperial, which had a slight recoil from the free advance it had recently been making, and a point was knocked off the price. Among the rest in the remoter world, Buenos Ayres was a little better, and Monte Video was a little worse. Business in the Water Companies was at its usual quiet level. Everything was strong, and almost wholly unchanged. But Kent, which is being treated to see-saw moves up and down of one point at a time, was put up 1 last week. And Lambeth tens were treated to a similar advance.

The daily operations were not of sufficient magnitude or interest to demand separate notice; and the changes did not amount to one a day. On Monday, Lambeth Water rose 1. Tuesday, Buenos Ayres Gas rose ¼. Wednesday, Kent Water rose 1. Thursday, Monte Video Gas fell ½. And Friday, Imperial Continental fell 1.

At next Friday's Students' Meeting of the Institution of Civil Engineers, the paper to be read is on "Gas-Engine Construction," by Mr. R. W. A. Brewer.

Mr. Geo. G. Ramsdell, of Philadelphia, who for a number of years was General Manager of the Gas Company supplying that city, has severed his connection with the Company, and on the 1st prox. will assume the position of General Manager of the Connelly Iron Sponge and Governor Company, of 395, Broadway, New York. Mr. Ramsdell has just finished a brief business trip to this country in the interests of his new connection, and while here he entered into arrangements by which he will represent Messrs. Jonas Drake and Son, of Halifax, for the introduction in the United States of their systems of inclined and horizontal retort installations, including their patent tube regenerator furnaces and other special appliances connected therewith. He also takes back with him the United States agency for the "Kreiss" conveyor. Mr. Ramsdell returned to America on Friday morning, sailing from Southampton in the *Deutschland*.

OBITUARY.

Mr. Alfred Barnes, Deputy-Lieutenant for the county of Derby, and formerly M.P. for the Chesterfield Parliamentary Division, died last Thursday, at his residence, Ashgate Lodge, Chesterfield, at the age of 78. Mr. Barnes was one of the earliest to develop the Derbyshire coalfield, and was the owner of one of the finest collieries in the county, at Grassmoor, which can produce as much as 24,000 tons of coal per week. It was exactly 55 years ago last Tuesday that Mr. Barnes, with very little capital, and without any knowledge of coal mining, leased from the Duke of Devonshire a large area of coal ground. Before the great movement in 1871, he purchased 350 trucks without having a penny towards paying for them. By this means he was able, when a rush of trade occurred, to reach markets which to others were closed for want of railway waggons. He always prided himself on the machinery and appointments at his colliery; and he made any improvements that suggested themselves, regardless of expense. Mr. Barnes was a large shareholder in several railway companies, and possessed considerable freehold property.

We regret to record the death, on Monday morning last week, of Mr. D. M. Nelson, the senior partner of Messrs. D. M. Nelson and Sons, of Glasgow. Deceased was quite recently attending to his business; but he unfortunately took a chill on the afternoon of the 20th ult., and succumbed to its effects. In early life, Mr. Nelson was in the service of Messrs. Laidlaw, whose representative he was for a number of years. He then started in practice as a Consulting Engineer and contractor for supplies to gas-works and other undertakings. His connection extended over the whole of Scotland and the North of England. For many years he was a conspicuous figure at meetings of gas managers in northern parts. He became agent for the Yeadon revolving retort on its being brought out; and his later energies were directed towards the introduction to agriculturists of a new manure, known by the name of "Firtos," which is a gas-works product. This material was exhibited in the Agricultural Section of the recent International Exhibition in Glasgow; and it is understood Mr. Nelson undermined his strong constitution by assiduous attention at the stall. The late Mr. Nelson possessed personal qualities which gained for him many friends; and he was always ready to assist others, not unfrequently to his own disadvantage. His memory will be cherished by his family and a large number of private and professional friends. The business will be carried on, on behalf of the widow and family, by his son, Mr. G. R. Nelson, who has been associated with it for the past eighteen years.

PERSONAL.

Mr. S. Arthur Carpenter has resigned his position as Manager of the Sandwich Borough Gas-Works.

The Edinburgh and Leith Gas Commissioners have elected Mr. D. Purves, who has been doing the work for some time, Convener of the Works Committee, in succession to the late Mr. Kinloch Anderson.

Mr. Samuel Milne, who has been acting as Engineer to the Aberdeen Corporation gas undertaking during the absence, through illness, of Mr. Alex. Smith, the Engineer, has been recommended by the Gas Committee for appointment permanently as Assistant Gas Engineer.

The Directors of the Skegness Gas Company recently called in Mr. E. J. Brockway, Engineer to the Cleethorpes Gas Company, to confer with them respecting the Skegness Gas-Works. As a result, Mr. Brockway has accepted the position as Engineer to the Skegness Company, who have decided to apply to Parliament for statutory powers to raise additional capital. It is intended to reconstruct the works.

At a meeting of the Water-Works Committee of the Halifax Corporation, held last Tuesday, Mr. James A. Paskin, the Water Engineer, tendered his resignation; and it was, after some deliberation, accepted, subject to certain recommendations, which will come before the Council for confirmation. Mr. Paskin, who has held the position for many years, is to be retained as Consulting Engineer for a term of years, at a salary of £100 per annum. Mr. R. J. Hartley, the present Assistant Engineer, is spoken of as the probable successor to the vacancy.

There are very few men at present engaged in the gas industry who can boast of fifty years' continuous service in connection with one undertaking. This gratification may, however, be experienced by Mr. Thomas Gilbert, of Leicester, who last month completed a half-century's connection with the Leicester Gas-Works. Mr. Gilbert entered the fitting department of the works in October, 1851, when they were in the hands of the Messrs. Robinson. After remaining there 12 years, he became a meter inspector, which position he filled for 28 years. When the building of the Aylestone Road works was commenced, he was entrusted with the supervision of the laying of a 36-inch trunk main; and the satisfactory manner in which this was done led to his appointment as inspector of mains and services. The extent of the development of the distributing plant will be appreciated from the statement that up to the year 1878, when the Corporation acquired the undertaking, only 90 miles of mains had been laid; whereas the number now is upwards of 200. Two years after the transfer, an exhibition of gas appliances was held, the results of which were so encouraging that the Gas Committee decided on establishing a special department for the cooking branch of their business; and Mr. Gilbert was appointed stove inspector—a position he held for 18 years. His long service at the gas-works has been deemed worthy of recognition by a local paper, which recently gave his portrait, accompanied by the sketch of his career from which the foregoing particulars have been taken.

There is in Glasgow, in the service of the Corporation Water Commissioners, a gentleman, Mr. Andrew Gillespie, who has had an interesting career in connection with gas and water affairs. Some forty years ago he was in the service of Messrs. Laidlaw and Son, and early in the sixties he became attached to Messrs. Lambert and Sons, of London, specially for superintending the building of a gas-works at Bari, in Italy. He was about a year engaged in this work, and he had only one Englishman under him—all the rest of the hands being Italians. Strange to say, Mr. Foulis, who also hailed from Glasgow, was at the same time erecting gas-works in Malta and other parts of Italy for the Malta and Mediterranean Gas Company. Mr. Gillespie put up at Bari a gasholder having a capacity of about 200,000 cubic feet. He remained there until the works were actually started. For Messrs. Laidlaw and Son he subsequently did a large quantity of work, both at home and abroad. He erected a holder at the Commercial Gas-Works, and also did work for the old Phœnix Gas Company, and likewise at Croydon. On returning to Glasgow, he was sent by Messrs. Laidlaw to erect the gas-works at Langbank, near Port-Glasgow, of which the elder Mr. Laidlaw felt specially proud. Mr. Gillespie also put up a gasholder 70 feet in diameter at Aarhuus, in Denmark. He likewise erected a set of large purifiers at Aldershot. In the course of his connection with gas-works, he erected a holder at Annan, on the coast of Dumfriesshire, and did work for the Portsea Island and Hastings and St. Leonards Gas Companies. In or about the year 1869, he was appointed by Mr. Foulis (who had become the Engineer and Manager of the Glasgow Corporation Gas-Works) Manager of the Tradeston Gas-Works, which he carried on exceedingly well. He subsequently joined the service of the Water Department, and has held an important post for nearly thirty years, the duties of which he has faithfully discharged under Mr. J. M. Gale, M.Inst.C.E., the Water Engineer to the Corporation.

We learn from the "Bombay Gazette" of the 13th ult., that a very cordial reception was given to Mr. F. W. Chamberlain, the General Manager and Engineer of the Bombay Gas Company, on his return to Bombay on the previous day, after a long visit to Europe for the benefit of his health. The works and the approach thereto were gaily decorated with triumphal arches, bearing the word "Welcome," Venetian masts, flags, bannerets, and evergreens. By seven o'clock in the morning, about 400 of the Company's employees, with their relatives and friends, assembled in the yard; and when, a quarter of an hour later, Mr. Chamberlain drove up, accompanied by Mrs. and Miss Chamberlain, his carriage was unhorsed, and the *muccadums* of the Company drew it up to the main gateway. Mr. Chamberlain was welcomed by Mr. T. W. Lane, the Assistant Manager, amid the loud cheers of the assembly, and the strains of music from two string bands; and the new-comers were promptly decorated with garlands of flowers. An address was presented by Miss Raposo, daughter of Mr. J. G. Raposo, the oldest employee of the Company, on behalf of the workpeople. It set forth that they were not a little alarmed at Mr. Chamberlain's being compelled to leave suddenly for Europe owing to ill-health, and that they had been praying for his speedy recovery. It mentioned that he had always at heart the interests of the Company, and had been exemplarily kind to all the employees. They considered themselves most singularly favoured in having, during the time of plague and famine, such a kind and generous master; and they were grateful to him for the encouragement, help, and sympathy he had always extended to them. They felt sure that the Company would continue to flourish under his very able and discreet management. With the address was presented a silver tea service of Indian workmanship as a *souvenir* from the employees. Mr. Chamberlain made an appropriate reply, remarking that he was highly pleased with the hearty welcome he had just received. He then went over the works, which he inspected. After light refreshments, the proceedings terminated.

The Next "James Forrest" Lecture.—Sir William Roberts-Austen will deliver the tenth "James Forrest" lecture at the Institution of Civil Engineers on April 17, 1902; the subject being "Metallurgy in Relation to Engineering."

London County Council and Water Gas.—On the 30th of July last, the London County Council decided to ask the Board of Trade to urge the Government to take steps to promote legislation next session to give effect to the recommendations of the Departmental Committee on Water Gas. At the meeting of the Council to-day, the Public Control Committee will report the reception of a communication from the Board to the effect that the President will be prepared, if opportunity offers, to introduce a Bill "to give some authority power to make the necessary regulations with regard to the supply of water gas."

COMMUNICATED ARTICLE.

THE ECONOMICAL ADVANTAGES OF INCLINED RETORT-SETTINGS.

By W. R. Herring.

There appears to be a desire in some quarters to restrict the comparison of carbonizing costs to a portion only of the entire operations; and good grounds can perhaps be stated for doing so. But I am of opinion that the facts are not thereby accurately gleaned; and to me the only satisfactory basis is to know at what cost I can receive a ton of coal, pass it through my retort-house, and out as gas, coke, and refuse.

It is these items that we look for in official statistics relating to the cost of carbonization; and common practice has brought them down to a fairly comparative basis. The varying rates of wages, and the varying conditions of the amount of work, or rather the hours of physical labour exerted by the employees in different parts of the country, of necessity render individual comparisons slightly defective; but we should not lightly disregard common comparisons that have been founded on an established basis for years past. If the closest possible comparison is desired, one can avoid the difficulty of varying rates of wages, and time actually worked, by stating the facts in tons of coal per man per hour. But, from a business point of view, it is a question whether such minute comparisons are necessary.

The most important factor for an engineer to determine is the difference which a different system of carbonizing will bring about in his own particular locality, and in the works with which he must deal.

I have in the past founded, and still continue to found, my opinions upon the broad basis of published statistical results, which I have simmered down and applied to the conditions in which I happen to find myself at different times. I have already pointed out the fallacy of comparing a machine-charged retort-house which can be worked at full load throughout the year with one of an exactly similar size that is required to meet the varying conditions of the daily output. Machine-charging has had a very good innings during the past ten years. It is applied almost exclusively in many works, and to a great extent in others. The inclined-retort system has been applied almost wholly in the Brentford Company's works; and it has also been exclusively used at Huddersfield for six or seven years. There are other works working proportionately on a large scale with inclined retorts; but unfortunately they do not appear in the accredited statistical records. I am, therefore, compelled to state my case on the following statistics, abstracted from "Field's Analysis."

The statement comprises a notification of the carbonizing wages from and including the years 1891 to 1900 for the various works enumerated—excepting that I have divided the Edinburgh and Leith works, as the one is almost wholly machine-charging (excepting during the summer months), the Leith works entirely shovel work. No particular selection has been made, but simply random selections of large typical works where machinery is applied, and has its best chance.

Readers will be able to detect for themselves the towns in which machinery is used, either wholly or partially. Some have undoubtedly increased it considerably since the 1891 period; and a glance along the line of figures will show the carbonizing wages year by year. The last column shows the decrease or increase in the cost of carbonizing during this period for the different works; and it must not be forgotten that wages, on the average, have increased during the period under review.

Probably Leicester illustrates this point most clearly, where I believe there is nothing but scoop-charging and hand-work. Here the increase of wages is shown to be about one-third of a penny. Leith also is all hand-work, and shows an increase of 0·2d. as a result of an increase in wages.

Glance for a moment at the Brentford figures. Carbonizing wages have decreased since 1891 to the extent of 3·15d., entirely owing, in my opinion, to the inclined retorts. The next largest decrease in the cost of carbonizing is Glasgow, equal to 2·08d. The next greatest reduction is Edinburgh, of 1·52d.; the Crystal Palace figures following close after, with 1·5d. Notwithstanding the low rate claimed for doing part of the work at the East Greenwich station, the South Metropolitan Gas Company have only been able to reduce their wages in this period by 1·19d., as against the Commercial Company's 1·16d. These figures are worth pondering over, and should not be set aside as unworthy of comparison. They show a great deal of what has been going on during the past ten years, and what effect the large introduction of horizontal charging machinery has had upon manufacturing costs.

Why is it that Brentford has been able to reduce wages by 3·15d., which is double and treble the majority of the works during the same period, excepting Glasgow, which, under the peculiar circumstances of its association with one of the best-known types of machinery, is perhaps well left out of consideration? The cost per 1000 cubic feet in 1900 for the Brentford Company is also the lowest on the list, notwithstanding the fact that, with the exception of Glasgow and Edinburgh, it was the highest on the list in 1891. Wages have not been reduced, nor has the operator become willing to do more work in a given period of time. These figures, therefore, demand the gravest possible consideration at the hands of gas engineers who are desirous of doing their best for the concerns they control; and they cannot, and must not, be set aside with a brush of the hand without the parties so doing incurring serious responsibilities.

What other conclusion can we draw from this statement than that machinery, which has had a fair running for so long, has, on the average, only been able to accomplish one-third and one-fourth of the economy that can be brought about by the largely increased use of inclined retorts, as at Brentford? There are works on the list—notably Newcastle and Sheffield—that have only been able to save one-third of a penny in the ten years by the introduction of the most modern machinery for horizontal charging. Birmingham is another instance where they have saved only a half-penny; and I think the fact that Mr. Hack, with his large experience of machinery, is now engaged in the construction of inclined retorts is sufficient to warn those who will not see the advantages of the system to pause and reconsider their position. It may be that many installations in the country have not, in the first instance, been the success that could have been desired. Many reasons can be given to account for this.

Upon the introduction of the gaseous-firing system to horizontal retorts, were there not equally as many, if not more, failures in the first instance? And what man is there who would dare for a moment to now contest its utility, efficiency, and economy? If there was only one bench of horizontal retorts successfully fired on the regenerative principle, I would not care if there were a hundred failures. It would simply prove that the system was right, but that those who had applied it unsuccessfully had omitted some important factor in its application. So also with the inclined-retort installations. One installation must be accepted as a proof that the principle is right; notwithstanding the fact that other installations may have been erected which have caused considerable trouble and anxiety to those responsible for its introduction. The oft-quoted charge of deficient illuminating power, smaller yield per ton, &c., has been proved to be fallacious.

There is another fallacy one often hears of with regard to the increased wear and tear of an inclined retort-bench as compared with the horizontal bench, although nobody has hitherto been able to adduce reasonable facts to support it. Given a properly constructed bench, there is no reason why the life of the setting should not be equally as long, whether it is placed at an angle of 32° or on a horizontal line. It merely requires sufficient staying across

Abstract of Carbonizing Wages per 1000 Cubic Feet of Gas Sold for the London and Principal Provincial Gas-Works.
(Vide "Field's Analysis.")

Name of Works.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	Decrease (−) Increase (+) since 1891.
Gaslight and Coke	4·56d.	4·15d.	4·25d.	4·27d.	4·24d.	4·26d.	4·19d.	4·08d.	3·96d.	4·06d.	−0·50d.
Commercial	4·68	4·61	4·48	4·38	4·48	4·42	4·25	3·49	3·33	3·52	−1·16
South Metropolitan	4·01	3·78	3·66	3·32	3·06	2·99	2·78	2·79	2·77	2·82	−1·19
Brentford	5·32	4·56	4·33	4·19	3·12	2·64	2·51	2·38	2·33	2·17	−3 15
Croydon	3·61	3·59	3·72	3·96	3·81	3 44	3·53	2 96	2 99	3·04	−0 57
Crystal Palace	4·29	4·30	4 28	4·20	4·17	4·13	4·59	4·05	3 69	2·79	−1·50
Birmingham	3·41	3·54	3·62	3·35	3·09	2·92	2·92	2·83	2·96	2 91	−0 50
Brighton	3·38	3 58	3·61	3·51	3·46	3·16	3 13	2·96	3 50	3 52	+0 14
Leicester	2 91	2·69	2·87	2 79	2·87	3·15	3·33	3·09	3·17	3·28	+0·37
Manchester	3·57	3·58	3·41	3·43	2 98	2 78	2 81	2 64	2 87	3 07	−0·50
Nottingham	3·95	3·93	4·00	4·06	3·95	3 95	4·65	3·64	3·34	3·48	−0 47
Salford	4·47	4·27	4·16	3 80	4·11	3 89	3 91	3·80	3·50	3·74	−0·73
Newcastle	4·62	4·42	4·30	4·24	4·31	4·52	4·54	4 49	4·45	4·23	−0 39
Sheffield	3·47	3·33	3·28	3·22	3 23	3·16	3·08	3·05	3·23	3·08	−0·39
Glasgow	5·83	5·81	5 50	5·25	4·59	4 35	4·31	4 36	3 57	3·75	−2·08
Edinburgh	6·77	6·16	6·22	6·03	5·79*	5·95	5·62	5·32	5·09	5·25	−1·52
Leith	6 84	6·75	6·31	6·00	5 88	5·80	5 93	6·00	6 20	7 04	+0 20

* Machine stoking was introduced into the Edinburgh Works in October, 1895.

the lower fronts, to prevent a slight downward tendency on the first heating-up of the settings. After being once heated through and through to a carbonizing temperature, the setting is one solid mass for all practical purposes as regards a structure; and it is only at the firing-up and the letting-down on subsequent occasions that there is any tendency whatever to move. The wear and tear on the regenerative furnace and setting can be no greater, and the wear and tear on the retorts themselves must be considerably less, than when heavy rakes and scoops are being propelled and worked within them four or six times a day. There is nothing else peculiar to an inclined-retort installation where excessive wear and tear can take place. The elevators and conveyors are common to both systems; the buckstays, tanks, pipes, &c., being likewise, and good for fifty years. Why, therefore, should we suggest, without absolute proof, that the system costs more for repairs and maintenance than a horizontal bench? Published records prove the contrary.

The following statement of the items commonly termed wear and tear is abstracted from "Field's Analysis," and includes the Metropolitan and Suburban Companies as well as the Provincial Corporations and Companies, and notifies the item for the years 1897 and 1900 inclusive. I have taken this period as being more fairly representative of the time when the inclined-retort installations would have settled down to their normal conditions of repairs and maintenance.

STATEMENT *of the Items termed "Wear and Tear" per* 1000 *Cubic Feet of Gas Sold for the Metropolitan and Suburban Gas Companies, and also for the Provincial Gas Companies and Corporations.*

(*Vide "Field's Analysis."*)

Name.	1897.	1898.	1899.	1900.
	d.	d.	d.	d.
Metropolitan Companies.				
Gaslight and Coke	3·48	3·43	3·98	4·34
Commercial	3·40	3·61	3·14	3·20
South Metropolitan	4·14	4·14	4·15	4·02
Average	3·65	3·64	3·97	4·16
Suburban Companies.				
Brentford	3·65	3·34	3·55	2·85
Bromley	3·55	4·06	3·83	3·80
Croydon	2·86	3·90	4·08	3·61
Crystal Palace	3·77	4·02	4·23	5·00
Hornsey	3·05	3·16	3·10	2·71
Lea Bridge	6·49	6·15	5·50	5·86
Mitcham	4·79	4·71	4·93	5·22
Richmond	3·54	3·53	3·54	4·32
Tottenham	2·53	4·69	3·82	4·60
Wandsworth	4·26	3·60	3·96	4·52
West Ham	5·42	5·32	5·42	4·62
West Kent	2·76	2·26	2·60	2·58
Average	3·87	4·04	4·11	4·03
Provincial Corporations.				
Birmingham	4·81	4·74	4·91	4·77
Bolton	1·73	1·64	2·02	1·92
Bradford	..	..	..	2·77
Carlisle	3·45	3·61	3·95	3·28
Leicester	3·53	3·68	3·54	3·56
Manchester	3·51	4·95	3·70	3·53
Nottingham	3·69	4·33	4·19	5·26
Oldham	2·29	2·15	1·93	1·92
Salford	2·10	1·86	2·06	1·73
Average	3·67	4·07	3·80	3·68
Edinburgh and Leith	..	..	2·83	2·69
Glasgow	2·99	2·85	2·55	2·40
Dublin	2·81	2·59	2·80	3·49
Provincial Companies.				
Bath	4·86	5·07	2·65	4·77
Brighton	2·64	2·59	2·74	3·37
Bristol	3·17	2·67	2·27	2·63
Newcastle-on-Tyne	2·30	2·08	2·43	2·79
Plymouth	1·92	1·91	1·82	1·59
Portsea	3·21	3·03	2·60	3·44
Rochester, Chatham, &c.	3·58	4·55	3·49	3·99
Sheffield	4·94	4·72	4·72	4·50
Average	3·38	3·17	3·03	3·33

I do not omit to note the fact that in some instances these figures may be slightly misleading, in consequence of the renewal of plant and appliances being heavier in some places than in others at different periods. But, on the whole, the headings under which they are compiled are perfectly well understood throughout the country; and, on the average, the figures comprise items akin in all works. However, to render the comparison more accurate, I have struck the average for the different divisions, and will compare them with the same items for the Brentford Company's works.

The average cost of wear and tear charges in the Metropolitan Companies' works has risen from 3·65d. in 1897 to 4·16d. in 1900. In the case of the Suburban Companies, it has risen from 3·87d. to 4·03d. The Corporation works stood at 3·67d. in 1897 and 3·68d. in 1900; while the Companies stood at 3·38d. in 1897 and 3·33d. in 1900.

Let us compare these with the Brentford figures, which in 1897 were 3·65d.; in 1898, 3·34d.; in 1899, 3·55d.; in 1900, 2·85d. In other words, the Brentford repairs and maintenance costs (which of necessity include the carbonizing plant) stand at 2·85d. in 1900, against 4·16d. for the Metropolitan Companies, and 4·03d. for the Suburban Companies.

Are not these figures also worthy of the very closest consideration by gas engineers? It is no good setting them aside by saying that we know nothing of the local conditions, the rates of wages, or what items are included under the title of wear and tear. We do know, as a matter of fact, that the interpretation of the headings is well understood throughout the country; and the figures in themselves are comparative with the same works, if not closely applicable to others. I, therefore, suggest that they are worthy of the most profound consideration on the part of gas engineers responsible for the extensions of present and the building of new works.

In the issue of the "JOURNAL" for Oct. 1, a statement was published in connection with my "Congress" paper, setting forth the rates of wages per 1000 cubic feet of gas sold when manufactured in inclined retorts at Brentford and Huddersfield, as compared with earlier periods when manufactured in horizontal retorts. Mr. Husband reminds me that his are largely 15-feet and not 20-feet retorts as stated by me; and I desire to correct this now, and say that the bare cost of charging and drawing a 20-feet retort is no more than for a 15-feet retort. So that the advantages of the system would have shown to be even greater than the figures I have taken from "Field's Analysis" had Mr. Husband's structural conditions been such as to have allowed him to erect all 20-feet retorts, such as all modern installations are to-day.

NOTES.

Coating Cast Iron with Lead.

The process in common use for producing a coating of lead enamel on articles made in cast iron is to sift the powdered salt of lead, employed as a glaze, by hand on to the cast iron to which it is to be applied, which must have been previously heated to bright redness. This plan, which gives excellent results, is fraught, as the "Iron Age" points out, with serious consequences to the health of the workmen, owing to the inhalation by them of the fine particles of lead floating in the atmosphere of the workshops. Moreover, dust enters the pores of the skin; and in a few years the bulk of the workpeople engaged in this industry are affected. In a recent issue of "La Nature," M. Georges Caye described a process of applying a coating of lead enamel to iron surfaces by mechanical means, invented by M. Dormoy, of Longland (Aisne) whereby injury to health is avoided. The articles to be coated after being heated to redness, are placed in a double hermetically sealed chamber with glazed sides. Each half of the chamber can be worked alternately, and the surplus enamel powder, dusted over the metal by means of a sieve, is removed from the chamber by the draught from a high chimney. The necessary movements of the iron can be effected from the outside of the chamber; and the vibration of the sieves for the purpose of distributing the lead powder is provided for by an electrical beater.

Some Points of Calorimeters.

At a recent meeting of the Nottingham Section of the Society of Chemical Industry, Mr. Arthur Adams read a paper on the "Heat Producing Power of Fuel." The author stated that many kinds of calorimeters have been devised; but only two are in common use. The first was due to Lewis Thompson, and depended upon the method of mixing the fuel with substances rich in oxygen; the mixture being ignited by a fuse, and the heat produced communicated to a known quantity of water. There are many sources of error; and the results are only of relative value. In the second form of apparatus, devised by William Thomson, the combustion takes place in a stream of oxygen; the combustion products, together with the excess of oxygen, bubbling away through the water of the calorimeter, to which they communicate their heat. The author remarks that some recent experiments with the latter form of calorimeter have disclosed certain sources of loss, particularly in the moisture carried off by the products of combustion. This discovery led to investigations, which eventually pointed to the probability that with dry oxygen combustion is less complete than with oxygen charged with moisture. Referring to the work of Dixon and Baker, the author concludes that carbon burns with difficulty in dry oxygen, and in doing so forms a large proportion of carbon monoxide. Also, carbon monoxide only combines with dry oxygen with difficulty, even in the presence of an excess of oxygen—so much so, that the flame of carbon monoxide is extinguished when plunged into dry oxygen. The term dry oxygen in this connection means as dry as can possibly be obtained from the use of the best drying agents.

A Remarkable Effect of the English Patent Law.

A remarkable effect of the English Patent Law is observable in connection with a new Sheffield manufacture. In consequence of information received, that certain makes of American tool steel could be used in turning and planing metals at such speeds that the cutting tool itself became red hot, without losing its edge

Sheffield steel manufacturers have been experimenting in the same direction. According to a statement in the "Ironmonger," these investigations are proving incidentally profitable to many of the local engineering firms, whose business involves much turning and planing of steel parts. The new tool steel has not been brought to its present degree of efficiency without undergoing a vast amount of testing; and some of the engineering firms referred to have been supplied free of cost with all the tool steel required of them for the sake of the experience thus afforded of its suitability for fast work. In spite of the high degree of perfection already attained by several of the most noted makers of the new grade of steel, it is expected that the experimental work will go on for another year at least. Our contemporary heads its description of this notable state of affairs "Steel Given Away," without supplying the explanation, which is referable to the English patent law. It is not that Sheffield tool-steel makers are particularly generous, but that it is legally impossible for an inventor to obtain a patent for his invention after he has once tested it in commercial dealings with the products in the market. Consequently, any test of the value of a product of an invention which there is an intention to patent, must be effected otherwise than in the ordinary way of trade. The knowledge is worth having by possible patentees, as some good patents have been upset on this ground, which is technically called "prior user." It is a cause of invalidity which is usually discovered too late to be corrected.

Burning Gas Under Water.

Mr. H. Nicholson writes in the "Chemical News" upon the utilization of nascent carbon dioxide as a chemical reagent. Incidentally, the writer mentions having been engaged upon some experiments on a fairly large scale with explosive mixtures of air and inflammable gas, burning them in a specially constructed burner under water. This appears to be a distinctly novel way of applying the heating power of gas to a liquid. It occurred to the writer that as the carbonic acid was formed by the process of combustion in direct contact with, and under the surface of, the water, it might possess increased chemical activity at the moment of its generation, and decompose some salts of metals having insoluble carbonates in which it is in ordinary circumstances necessary to bring about decomposition with alkaline carbonates. In the manufacture of many chemicals carbon dioxide plays an important part; and up to the present time conjunction, in the form of an alkaline carbonate or bicarbonate, has been the usual method of applying it. Experimenting on borate of calcium as a beginning, Mr. Nicholson found, on suspending finely-ground borate of calcium in water, and boiling it with the flame of air and producer gas immersed in, and in actual contact with, the liquid, that decomposition occurs. Under ordinary circumstances boracic acid decomposes calcium carbonate slowly; but in the presence of nascent CO_2 calcium carbonate is formed, and boracic acid goes into solution. On withdrawing the burner, and so removing the influence of nascent gas, the free acid commences to decompose the $CaCO_3$ and reform calcium borate. The effect of the burner is an interesting example of the influence of nascent gases on chemical equilibrium, and opens up a large field for research. As Mr. Nicholson remarks, the combustion of gases under water, and in actual contact with it, is a singular phenomenon which presents a new sphere of possibilities in chemical reactions.

Wood-Stave Pipe for Force Mains.

An innovation in engineering methods has recently been advocated by Mr. W. C. Hawley, Assoc.M.Am.Soc.C.E., Engineer and Superintendent of Atlantic City (N. J.) Water-Works, where it has become necessary to add a 30-inch force main to the 12-inch and 20-inch mains already in service between a pumping-station and the city. According to particulars given in the "Engineering Record," these mains are laid close alongside a railway track for about four miles over salt meadows; and the jar of the trains is constantly straining and damaging the non-elastic lead joints, necessitating daily inspection and very frequent repairs. Moreover, the salt water has had the not unusual action on the iron, which has been changed in the course of a few years to a chalky condition to a depth of an inch. These exceptional local conditions led Mr. Hawley to make a careful investigation of all available materials for such an unusual situation, and to visit the leading cities of the West to inspect the wood-stave and riveted steel pipe used there to a large extent, with the result that he recommended the use of this pipe, for the following reasons: (1) As built, it is continuous, while the cast-iron pipe has a non-elastic lead joint at least every 12 feet. (2) The durability is the only point where cast-iron might have the advantage over wood-stave pipe, and this is somewhat questionable under the conditions on the meadows. The stave-pipe is designed with a safety factor of $4\frac{1}{2}$ or 5, and should a few of the bands be destroyed, it would be an easy and inexpensive matter to replace them. (3) The wood-stave pipe is much less liable to breaks or leakage than a cast-iron pipe; and it is so designed that it cannot burst. (4) The wood-stave pipe can be repaired with far greater ease than cast-iron pipe. (5) The difference in weight is, under the conditions on the meadows, very much in favour of the wood-stave pipe. There would be difficulty and expense in preventing serious settlement of a 30-inch cast-iron pipe in the meadow mud. (6) The carrying capacity of wood-stave pipe is considerably greater than that of cast-iron pipe, on account of the smoothness of the inner surface; and it does not decrease as does that of cast-iron pipe.

TECHNICAL RECORD.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The 128th Quarterly Meeting of the Institution was held last Saturday at Wakefield. For a November day, the weather was particularly benign; and this, combined with a very gracious reception on the part of the Chairman of the Gas Company (Dr. W. A. Statter) and his colleagues, and the preparation for the visit, and the technical fare provided, by the Engineer, Mr. H. Townsend, made the occasion one of supreme interest and enjoyment. The kind offices, too, of the Secretary of the Company (Mr. W. H. Parker) in looking after the comfort of the members, must be recognized.

The assembling-place was at the chief offices of the Company in Warrengate, which thoroughfare forms one of the boundaries to the gas-works. Most of the local members arrived betimes; and about 11.45 the Manchester contingent (which included the President, Mr. Charles Wood, of Bradford) were driven into the courtyard, having reached the Kirkgate Station a quarter of an hour previously. A few minutes were spent in the exchange of friendly greetings and the partaking of refreshment, which was only a small part of the generous and thoughtful hospitality displayed during the day by the Directors of the Company. The gathering was exceptionally numerous; and Mr. Townsend's desire to have a memento of the occasion was perfectly justified. Photographs were accordingly taken in the ground attached to the offices, over the extreme wall of which the gasholders formed an appropriate background. The arrangement of such a large company somewhat taxed the ingenuity of the photographers; but, after a little patient manœuvring, they succeeded in bringing the party all within the compass of the camera.

Immediately afterwards, the party passed on to the gas-works, and inspected the plant under the guidance of Mr. Townsend, who was helped considerably, in replying to the inquiries of the visitors, by his son and assistant (Mr. W. Townsend). It is unnecessary to state here all that the members saw, as, at the subsequent business meeting, Mr. Townsend fully described in a paper the new plant (including an inclined-retort house, and coal-elevating and coke-conveying machinery), the remodelling and rearrangement of other portions of the works, and the other features of interest, besides which some references are made to the works and other matters connected with the gas supply of the city in another part of this issue. Suffice it to say here, that the members made the best use of the time in minutely examining the new inclined settings and their working, and the De Brouwer coke-conveyor. Their verdict on both was favourable to the plant; and no one was heard to say that Mr. Townsend had not, under the peculiar circumstances of his site, provided the best means for obtaining the most economical results from the conditions which had confronted him.

A Lunch and a Hearty Reception.

By the coaches which had brought the Manchester party to the works, the visitors were next conveyed to the Strafford Arms Hotel, where the Chairman and Directors entertained them at luncheon, which was served in a most liberal style. The genial Dr. Statter presided; and on his right sat Mr. Townsend and Mr. Thomas Newbigging, and on his left the President and the Hon. Secretary (Mr. J. Wilkinson, of Sheffield). One of the vice-chairs was occupied by Mr. R. E. Goldthorp, the Deputy-Chairman of the Company.

Lunch ended, there was the usual expression of loyalty to the King; and then

Dr. Statter proposed the toast of "The Manchester District Institution of Gas Engineers." His speech was a happy one. Commencing with a hearty welcome, he said this was the first visit the Institution had paid to Wakefield; and now the members had found their way there, he hoped it would not be the last time. The Directors would indeed be very glad to welcome them on some future occasion. He noticed that this was the 128th quarterly meeting of the Institution, which meant that it was 32 years old; so that the organization was thoroughly well established. He spoke of the value of such societies as centres for the accumulation of facts, and the threshing out of experiences—taking as a parallel the societies of his own profession. He reminded the members that in meeting at Wakefield, they were in the home of the Rev. Mr. W. R. Bowditch, whose name was familiar to all gas engineers. Mr. Bowditch was, in fact, associated with his (Dr. Statter's) father in one of his patents. The late Dr. Statter was something more than an amateur gas engineer. He was Chairman at one time of five Gas Companies; and he had the engineering of one practically all to himself. He (the speaker) was also initiated early into the mysteries of gas engineering, because he used to draw his father's plans. He hoped the members had been interested in what they had seen at the gas-works, especially the labour-saving appliances. From the medical point of view, he thought stoking was work that it was not really fair to put upon a man. To charge a retort well was putting more exertion on to a man than was right, particularly when he had reached the age of 40 or 45 years. Apart from the economy which rendered labour-saving appliances necessary, he

thought the stoker himself ought to look upon the automatic feeding of retorts as a boon and a blessing. Alluding to electric lighting, he said he regarded it in the most friendly spirit, because he believed it had done them a lot of good, especially in spurring them on to make improvements for the production of cheaper gas. He wished the Institution all prosperity, and coupled with the toast the name of Mr. Charles Wood, the President.

The PRESIDENT, in responding, thanked the Chairman and Directors for the heartiness of their reception and the generous manner in which they had entertained the members. He was sure the large number of members who had accepted the invitation to be present would all carry home with them very satisfactory memories of the proceedings that day. He was certain he was voicing the opinion of the members generally in saying that the Chairman and Directors had certainly been successful in converting a somewhat antiquated portion of their plant into one on the most modern lines; and he was convinced they would never regret the change.

Mr. THOMAS NEWBIGGING (Manchester) proposed "Prosperity to the Wakefield Gas Company." After acknowledging the kindly reception of the members, Mr. Newbigging spoke of the usefulness and stimulating influence of such visits as they had had that morning. He then recognized the confidence which the Directors of the Company had in their Engineer, and afterwards alluded to the pleasure he had had in knowing the late Dr. Statter and the present Chairman. Knowing the Chairman and the officials of the Company, he had the best reasons for saying that the lighting of the city of Wakefield was in safe and capable hands. Referring to Dr. Bowditch, he mentioned that the Doctor's work on the manufacture and chemistry of gas was one of his (Mr. Newbigging's) earliest studies. That book was one of the best ever written on the chemistry of gas lighting; and if ever the younger members of the gas profession had an opportunity of getting hold of a copy, they ought to do so. He could assure the Chairman that Dr. Bowditch's memory was held in the highest esteem by gas engineers.

The toast was enthusiastically honoured.

The CHAIRMAN, DEPUTY-CHAIRMAN, and Mr. TOWNSEND (by the request of Dr. Statter) all responded—Mr. Townsend making acknowledgment of the hearty way in which the Chairman and Directors had acquiesced in his suggestion that the Institution should visit the works.

THE BUSINESS MEETING.

A few minutes later, the members assembled in another room of the hotel for the transaction of the ordinary business and the discussion of Mr. Townsend's paper describing the works under his charge.

On the PRESIDENT taking the chair,

The HON. SECRETARY (Mr. J. Wilkinson) read the minutes of the last meeting; and on the motion of Mr. ISAAC CARR, seconded by Mr. ARTHUR GRAHAM, they were confirmed.

It was next mentioned by the HON. SECRETARY that he had received fifty letters of apology for non-attendance. Altogether, he added, he had had 120 replies respecting this meeting, which he believed was a record.

ELECTION OF NEW MEMBERS.

The following candidates for admission to membership were unanimously elected: Mr. S. E. Halliwell (Littleborough), Mr. Harry Marsden (Honley), Mr. Arnold E. Mottram (Ossett), Mr. F. Barrett (Ramsbottom), and Mr. J. Wilkinson (Drighlington).

THE PAMPHLET RECORD OF THE PROCEEDINGS.

Considerable discussion followed as to the desirability of continuing to print the proceedings of the Institution in pamphlet form. The President mentioned that the question was brought forward at the last Committee meeting. It was considered by some that the expenditure of from £10 to £15 a year in printing a separate report was unnecessary, seeing that, before the members received the pamphlets, reports had appeared in the technical press. The Committee desired that the matter should be brought before the members for their decision. Replying to Mr. G. B. Smedley (New Mills), the President said the Committee did not make a recommendation on the subject. Strong opposition to the suggestion was offered by Mr. Isaac Carr, who moved that the issue of the pamphlet reports be continued; and he referred to their great convenience. Taking the same point of view, Mr. W. Taylor (Glossop) seconded the motion. Mr. T. Newbigging (as a member of the Committee) disassociated himself entirely from the suggestion. He could not imagine how such a thing came before the Committee; and he considered that the independent printing of their proceedings added distinction to the Institution. Mr. Smedley said his idea was that perhaps the Committee were contemplating the expenditure of the money in lectures by some Professor, which would be very beneficial. If they could do both—have the lectures and the pamphlets—it would be a decided acquisition to the value of the Institution. Mr. S. S. Mellor (Northwich) doubted whether 50 per cent. of the members preserved the pamphlets; and he thought perhaps the money might be spent to better advantage—say, in research work. Mr. William Carr thought the money was very badly spent, as he could very readily put his hand on anything he wanted in the pages of the "JOURNAL OF GAS LIGHTING." However, as a member of the Committee, he was quite prepared to abide by the decision of the members.

On Mr. Isaac Carr's motion for the continuance of the printing of the report being put, it was carried by 29 votes to 21.

THE NEW PRESIDENT.

Mr. TOWNSEND proposed that Mr. Arthur Graham be elected President for the ensuing year. Most of the members had known him for a number of years; and they had been stimulated by his genial presence at their meetings. It needed no words of commendation from him (Mr. Townsend) to justify the members' acceptance of Mr. Graham for the position.

Mr. H. HAWKINS (Todmorden) seconded the motion, which Mr. W. W. HUTCHINSON (Barnsley) cordially supported.

The proposition was carried by acclamation.

Mr. GRAHAM, in thanking the members for honouring him in this way, mentioned that it was now fifteen years since he joined the Institution, during which period he did not think he had been absent from the ordinary meetings more than half-a-dozen times, nor from the Committee meetings during the time he had held office. He should be delighted if the members would visit Mansfield next year for one of the meetings.

Mr. H. TOWNSEND then read his paper on

THE WAKEFIELD GAS-WORKS.

As this is the first visit of the Manchester District Institution of Gas Engineers to Wakefield, it may perhaps be interesting to point out that it is a very ancient city; being a place of some importance before the Norman conquest. Edward the Confessor was Lord of the Manor of Wakefield. Its name is derived from two Anglo-Saxon words—Wacu, a vigil, and feld, a clearing in the forest. Wakefield thus means a town where wakes—that is, vigil feasts—were held. I hope the function at which we have just assisted has not belied the ancient name of the city.

The first Act constituting the Wakefield Gaslight Company was obtained in the year 1822. The works were then erected; and commenced supplying gas to the inhabitants on Jan. 31, 1823. A new Act was obtained in 1847, and another in 1877. These Acts have provided sufficient capital and powers to carry on the Company up to date; and, with care, will enable us to go on some years longer. The works are still situated on the original site, which is expensive and inconvenient, as the railway and canal systems are each nearly a mile away; so that everything has to be carted in and out.

When I was appointed Engineer and Manager, my first idea was to build a new works, with both railway and canal accommodation, in preference to spending any more money on the present site. But the heavy outlay this would have involved, together with the necessity for going to Parliament, with the almost certain prospect of rousing various sleeping dogs whose repose was much to be preferred, ultimately convinced both the Directors and myself that "'twere better to bear the ills we have, than fly to others we know not of."

In olden times, when the mountain would not come to Mahomet, Mahomet went to the mountain; so as we cannot get to the railway, we are trying to get the railway to come to us. A Company have obtained powers to construct a light electric railway in Wakefield and neighbourhood; and as it would pass close both to our works and the existing railway system, we have asked the promoters to consider whether it would be worth their while to deal with our traffic. They have already decided to adopt the railway gauge of 4 ft. 8½ in.; so that all that would be necessary would be to connect the light railway with the existing railway system at one end, and with our works at the other, by extra strong rails. The Company could then handle all our traffic during the night—after their ordinary passenger traffic is finished. If it can be accomplished, it would be beneficial to all parties—to the Corporation, whose roads would be relieved of between 20,000 and 30,000 tons per annum of heavy traffic; to the shopkeepers and the light railway itself, both of whom would be greatly benefited by having our coal-carts taken off the streets during business hours; to the existing railways, as they would get an additional amount of traffic from us; to ourselves, as we should have greater convenience in handling our heavy materials; and, lastly, to the gas consumers, who would get the benefit of anything tending to cheapen the cost of production.

The increasing demand for gas, in spite of all competition, compelling us to consider some means of increasing the output, the long and narrow nature of the site pointed to inclined retorts as the most suitable method of carbonizing, as all the coke in this system comes out at one side of the retort-house, whereas with any other method it is delivered on both sides, which was impossible in our case; and the Directors accordingly decided upon an installation of inclined retorts.

As in most works which have gradually grown during a long course of years, the actual manufacturing site was crowded with plant and buildings of one sort or another; and a considerable amount of preliminary clearing was necessary before operations could be fairly commenced. The first thing to do was to provide an inlet for the coals to the back of the retort-house, where it was decided to place the breaker-pit. This necessitated removing the old boilers, boiler-house, and engine-room, which completely blocked the way; and advantage was taken of the opportunity to bring this part of the works up to date.

A new boiler-house was erected and provided with two Lancashire boilers, 28 ft. by 7 ft., fitted with Meldrum's furnaces for burning breeze. A Green's economizer (which is a Wakefield speciality, by-the-bye) was introduced, and the two old boilers converted into overhead tanks—one for the feed-water of the boilers, and the other for tar. The overhead water-tank is fed through a ball-cock cistern, which always keeps it full of water. The water is heated by exhaust steam to 120° Fahr., and is then pumped through the economizer into the boilers. In this way we get plenty of very cheap power.

The next step was the provision of an exhauster-house, and two pairs of Donkin's twin exhausters, each of 40,000 cubic feet per hour capacity. We then had to shift a Korting-Cleland steam scrubber, consisting of 45 pipes about 45 feet high. Having no other use for it, we made this into a scrubber of the ordinary type; filling the pipes with wood spirals made in 3-feet lengths, over which ammoniacal liquor was forced by means of a powerful double-ram pump.

Having thus obtained access to the position for the coal-breaker pit, it now became necessary to pull down two of the existing retort-houses and benches (which were very antiquated and dilapidated), in order to erect the inclined retort-house on the site. This proved a very difficult task, as one of the retort-houses had to be kept in full operation all the following winter. It made it necessary to carry up the shell of the new retort-house in two sections—one-half one year, and the remainder the next; and also made it unavoidable to build the walls from foundation to roof (a height of over 50 feet) in about two months. It was naturally expected that these walls would settle and crack, especially as they had to face the equinoctial gales as soon as they were finished, and the frosts of a severe Winter, without any roof to tie them together, owing to the difficulty of getting any ironwork at this period. We had to devise a rough-and-ready timber girder, about 8 feet deep, to tie these walls together; but it was anything but a pleasant experience to have our working retorts overlooked by these gaunt walls, over 50 feet high, exposed to all the winter gales.

Next spring, as soon as the weather permitted, we pulled out the second retort-house, and proceeded with the other half of the building. We found on plumbing the walls already built, that they had each come in about 3 inches. This was far better than leaning outwards, but was still very objectionable. We tried to jack them back into their proper position, but found it impossible to do so. We then had to build the new walls to suit the old ones—getting the buttresses at the end of the building plumb. This deflection of the walls made it rather awkward to fix the roof and the gutters. But when the whole job was completed no sign was visible of the difficulties which had occurred; and we have had no further trouble with it. This, I think you will allow, reflects credit upon the Contractors—Messrs. Flower Bros., of Wakefield.

In designing this retort-house, as I knew it would have been very awkward to have to wait for anything, I decided to build it entirely of brick—the arches, plinths, sills, cornice, and string courses being of blue Staffordshire bricks, and the body of the walls of red brick. At this point, I may say that anyone intending to build an inclined retort-house should, if possible, find a new position for it, as it is an extremely difficult job to erect one on the site of old retort-houses which have to be kept going while the change is taking place.

The erection of the inclined retort-benches, the coal elevators and conveyors, and the roof of the building, was entrusted to Messrs. Jonas Drake and Son, of Halifax, who carried out their work in a most conscientious manner. There are nine benches of retorts, each containing eight retorts, 20 feet long, tapering from 22 in. by 16 in. at the charging end, to 26 in. by 16 in. at the discharging end; and they are set at an inclination of 32°. The reason I decided upon these large retorts was that three of these benches would be just enough to make gas in the summer months; while with smaller retorts, three beds would have been too few and four beds too many. The retort-benches are 11 ft. 7½ in. in width, from centre to centre of the piers; the arches being 9 ft. 9 in. in the clear, and the piers 1 ft. 10½ in. thick. Each retort is fitted with an 8-inch ascension pipe, and each bench has a separate hydraulic main, with a 10-inch weir-valve to adjust the seal, and the usual appliances for working with a liquor seal.

The hydraulic is supported on girders in front of the setting—a platform giving easy access to all its parts. The gas is taken by means of a 24-inch steel main to the condensers, which are of the slow-speed Cleland description, and are under cover, in order to keep the temperature under control.

The coal-elevating plant is all in duplicate. There are two steam-engines, each of a capacity of 12-horse power, two coal-breakers, elevators, and conveyors, each of a nominal capacity of 30 tons per hour, and so arranged that either engine can work either set of breakers, elevators, and conveyors, or both sets of plant can be worked together, giving an available nominal capacity of 60 tons of coal per hour, or almost any variation can be made. So that if one engine, breaker, elevator, or conveyor breaks down, the other can do the work until it is repaired. This has proved a very necessary precaution, as breakdowns of the coal plant were at first unpleasantly frequent. The weak points have been remedied, however, and now the plant works satisfactorily.

The continuous coal-hoppers are also larger than usual, and will hold a 36 hours' supply. I intended having a 48 hours' stock, but could not find sufficient space for the large hoppers; the reason being that as all our coal comes in by road, this would have been the cheapest and easiest way of providing for the supply from noon on Saturday until Monday morning, as we find it practically impossible to suspend gas making during the winter months when the coal requirements are heaviest. The unusually large capacity of our coal-conveying plant is due to a similar reason. Carters seem to be a particularly gregarious class of men, and come in with a rush—twenty carts at a time being no uncommon occurrence; and they will not wait patiently while a small plant is slowly relieving them of their loads. But with our two plants working together, we can soon polish them off.

When designing the retort-house, I always intended taking the coke away by means of a conveyor; for, owing to the peculiarities of the site, all of it had to come out of the house practically at one point. However, owing to the difficulty of getting ironwork just then, we had to start the house without a conveyor, and take the coke away by means of barrows.

As we sometimes put a charge of 10 cwt. of coal into one of our retorts—although more often the charge is 8 cwt.—one can imagine the barrows had to be pretty roomy, as 10 cwt. of coal will produce between 6 and 7 cwt. of coke. It was no joke for a man to drag between 6 and 7 cwt. of red-hot coke away in a barrow; and we had endless trouble the first winter in getting it removed. After half a shift of this work, the men often wanted their money; and it became a sort of nightmare how to get the coke dealt with. It was, therefore, with a feeling of relief that the coke-conveyor was at last got to work.

The apparatus is of the De Brouwer type, and has been supplied by Messrs. W. J. Jenkins & Co., of Retford, who have spared no pains to make it a success. It consists of a trough 2 ft. 6 in. wide running along the coke-floor of the retort-house—an endless chain with ⅞-inch round bars at regular intervals of 2 feet carrying the red-hot coke along this trough, and discharging it, partly quenched on its way, on to a cross conveyor of the same type, elevated at an angle of about 30°, where the process of quenching is automatically completed. This conveyor tips the coke into a revolving screen, which takes out the breeze and then deposits the coke on to a radial conveyor, from which it passes down a shoot into the coke yard.

The radial conveyor is 80 feet long, 25 feet above the ground, and traverses a semi-circular gantry of curved joists supported by columns. The conveyor is provided with sliding doors and shoots at regular intervals, so that the coke can be stored over a semi-circular area, 80 feet radius by 25 feet deep, which will accommodate over 3000 tons. The whole coke-conveying plant is driven by means of a 12-horse power steam-engine; and it works admirably, and is much esteemed by the stokers, who can get their work done quicker and easier, and who now escape the awful drudgery of dragging about barrows containing 6 or 7 cwt. of red-hot coke. The only drawback I can see is that it makes more breeze than the barrows. I expect the wear and tear will be pretty heavy; but so far we have not had it working long enough to form a reliable opinion. Our carbonizing is now as automatic as it is possible to make it. From the time the coal enters the works until the coke is deposited in the yard, it is practically not touched by hands.

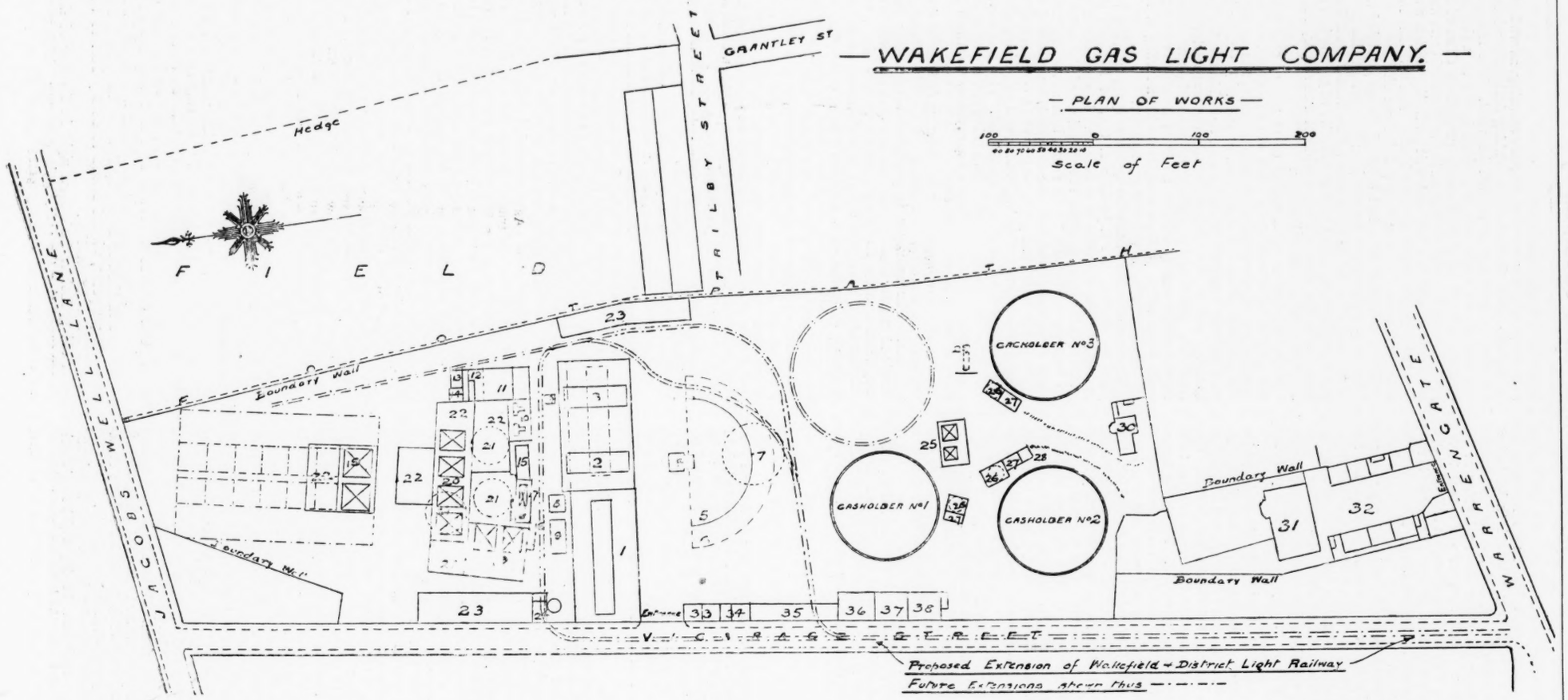
When designing this coke plant, we were selling nearly all our coke for malting purposes, and it was necessary to store a considerable quantity, as most of it was wanted in the spring. But alas for the mutability of human affairs, along comes the arsenic scare, and our malting trade is absolutely gone—we do not now sell a single ounce for that purpose. The necessity for storage is gone; and we are consequently selling our coke as fast as we make it. Should we be unable to do so, or should we get the malting trade back again, we can store it, as described above, with the greatest ease. As you know, I did my best to minimize the damage to our coke trade through the arsenic scare by drawing attention to it at our Manchester meeting in February, and pointing out that our industry ought to be represented before the Royal Commission. Attention being thus drawn to the matter, the question was taken up by Mr. George Livesey (to whom I beg to take this opportunity of expressing my acknowledgments) and the Gas Companies Protection Association; so I hope the malting trade will ultimately come back to us again.

The export duty of 1s. per ton, and the general decline in trade, together with the arsenic scare, have caused quite a slump in the coke market, as we are all painfully aware. I have often been puzzled to know how one of my neighbours could get so much more for his coke than we could. Upon making enquiries, I find that he breaks it to a suitable size for domestic purposes, and then delivers it to his customers in small quantities; taking orders for the delivery of as small a quantity as 1 cwt. in any part of his district. After carefully considering the matter, I am convinced that this is the correct policy for us all to adopt.

My friend's works are situated in the heart of the coal-fields; and if he in such a district can sell his make in his own town, well any of us can do so, instead of cutting each others' throats as we do at present by sending the coke we cannot dispose of locally into our neighbour's district, and so bringing down his price. Our coke-conveyor will save us the trouble of breaking our coke, as it does this without being asked; and I am trying to devise a method of screening it, so as to make it suitable for domestic purposes, when I intend to do my best to work up a local domestic connection.

An old gasholder tank came right in the way of the curved gantry supporting the radial coke conveyor. This necessitated the construction of a strong lattice girder to carry the gantry.

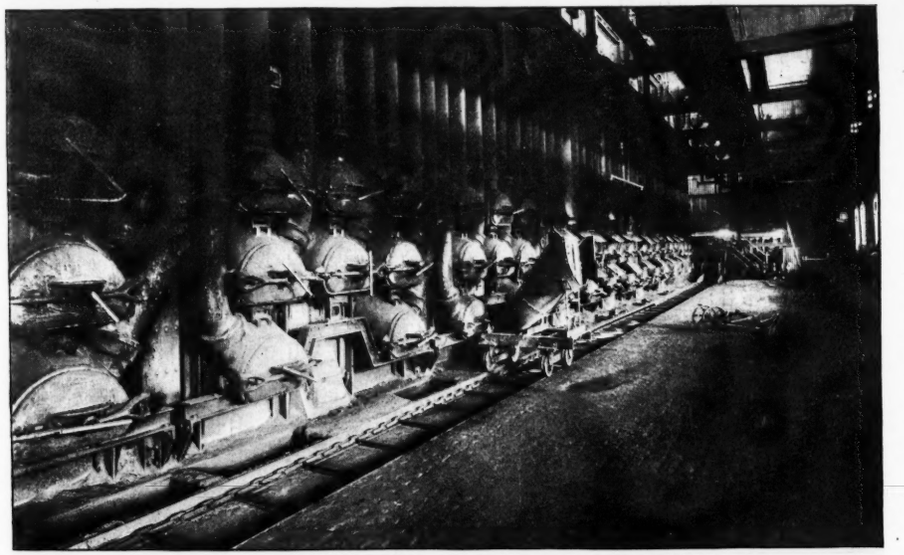
GROUND PLAN OF THE WAKEFIELD GAS-WORKS.



1. Inclined Retort-House.
2. Nos. 5 and 6 Retort-Houses.
3. Nos. 7 and 8 Retort-Houses.
4. Coke Engine-House with Overhead Breeze-Hoppers.
5. Curved Gantry for Radial Conveyor.
6. Area over which Coke can be Stored.
7. Underground Water-Tank.
8. Coal-Breaker Pit.
9. Air Condensers.
10. Exhauster-House.
11. Boiler-House.
12. Economizer.
13. Mortar Pan Engine-House.
14. Overhead Tar and Feedwater Tanks.
15. Pipe Scrubber.
16. Walker's Purifying-Machine.
17. Clapham's Washer-Scrubber.
18. Tar and Liquor Pumps.
19. No. 1 Purifying-House.
20. No. 2 Purifying-House.
21. Tar and Liquor Wells.
22. Lime and Oxide Sheds.
23. Coal-Stores.
24. Overhead Tar, Liquor, and Water Tanks.
25. Meter-House.
26. Valve-Houses.
27. Governor-Houses.
28. Maxim Carburettor House.
29. Underground Benzol Tank, Capacity 3000 galls.
30. Store.
31. General Offices.
32. Gas House Yard.
33. Weigh Office and Engineer's Office.
34. Stores.
35. Shed for Stores.
36. Blacksmith's Shop.
37. Meter-Shop.
38. Show-room.

THE NEW INCLINED RETORTS AND DE BROUWER COKE-CONVEYOR AT WAKEFIELD.

THE CHARGING-FLOOR OF THE INCLINED RETORT-HOUSE.



THE DISCHARGING-FLOOR, WITH THE DE BROUWER COKE-CONVEYOR.

THE RADIAL CONVEYOR FOR DISTRIBUTING THE COKE ON THE STORAGE GROUND.

THE GANTRY ON WHICH THE RADIAL CONVEYOR RUNS.

The old gasholder tank has been covered over; and is used as a receptacle for all the rain which falls on the coke-yard and the surrounding buildings. This water is pumped into an overhead tank, from which it is conveyed into the retort-house for quenching the coke—the surplus running back to the underground tank, and being used over and over again.

As you will have noticed, all our engines are driven by steam. We adopted this form of power in order to use up the large amount of breeze, for which we have no market; but we hope shortly to have a gas-engine to drive the tools in the engineer's shop, and fans for the smith's fires, &c., and to convince the sceptical that we believe in gas-engines.

The working results of carbonizing by means of slopers during the half year ending June 30, 1901, compared with shovel charging and direct firing during the same period of 1900, as shown in the balance-sheets for the two half-years, are as follows:—

Gas made per ton of coal carbonized in 1901	10,017 cub. ft.
Do. in 1900 by old retort-benches, which heated very badly	9,498 ,,
Illuminating power in 1901	17 candles.
,, ,, 1900	17 ,,
(no enricher being used in either year.)	
Coke sold per ton of coal in 1901	11·47 cwt.
,, ,, ,, 1900	9·24 ,,
Coke used for fuel, per cent. of make, in 1901.	12·62
,, ,, ,, ,, 1900.	22·94
Coke used for fuel per 100 lbs. of coal in 1901.	7·90 lbs.
,, ,, ,, ,, 1900.	13·70 ,,
(Coke estimated at 12 cwt. per ton of coal carbonized.)	
Tar made per ton of coal in 1901	12·09 gallons.
,, ,, ,, 1900	11·67 ,,
Ammoniacal liquor made per ton of coal in 1901	24·50 ,,
,, ,, ,, 1900	22·18 ,,

With respect to the labour question, we man our retorts as follows on each of the two shifts:—

3 beds—one man on charging-floor and two men on drawing-floor.
4 beds—one man on charging-floor, two men on drawing-floor, and one man to attend to fires.
5 beds—two men on charging-floor and three on drawing-floor.
6 beds—two men on charging-floor and four on drawing-floor.
7 beds—two men on charging-floor, four on drawing-floor, and one man to attend to fires.
8 beds—two men on charging-floor, four on drawing-floor, and one man to attend to fires.
9 beds—three men on charging-floor and six on drawing-floor.
(the same number of men would do 10 beds, if we had them.)

The cost of carbonizing works out at 1s. 3·54d. per ton of coal carbonized by means of inclined retorts, as compared with 2s. 6·82d. per ton by means of shovel charging, or a saving of 1s. 3·28d. per ton in favour of inclined retorts, Carbonizing wages consist of the wages of stokers, firemen, retort-house foremen, and boiler-house men; coal and coke trimming being debited to coal and coke respectively, both with inclined and ordinary retorts. The maximum make of gas per bed in twenty-four hours has been 134,000 cubic feet, with six-hour charges.

In common with most other users of inclined retorts, we had a lot of trouble and expense at first with the mouthpiece stops; but we have now devised a stop which lasts a considerable time, is very simple, and gives little trouble. It consists of a steel plate ¼ inch thick, dished at the top, and attached by two rivets to a wrought-iron handle, all in one piece, with a chisel edge, which rests against a slot in the bottom of the mouthpiece; the whole stop being nicely balanced so as to be easy for the stoker to handle.

The cost of the extensions at the works has been as follows:—

New engine and boiler houses, new boilers, economizer, steam-pipes, &c.	£2,372	5	11
New exhauster, washer, &c.	2,053	3	3
New inclined retort-house	14,429	10	11
Coke-conveyor	2,215	0	0
New purifiers, shed, and connections	1,531	7	6
Carburetting plant, steam-pipes, &c.	429	0	0
Total	£23,030	7	7
Less old buildings and plant displaced to be paid out of revenue (at present placed to suspense account), valued at	8,840	0	0
Net cost	£14,190	7	7
The inclined retorts were started in October, 1900. During the year which has now just elapsed, we have saved in wages	£1,603	10	2
During the past half year we saved 923 tons of the coke used for fuel. On the coal carbonized last year, this would amount to 1897 tons. Valuing this at the low figure of 6s. per ton would give	569	2	0
Then we used 911 tons of coal less in the half year. This would equal during the year 1809 tons of coal saved. Valuing this at the low figure of 10s. 6d. per ton would give	949	14	6
Total	£3122	6	8

Or a total saving per annum of £3122 6s. 8d. on a net expenditure of £14,190 7s. 7d.

In the future we shall also get the benefit of the saving in labour by the use of the coke-conveyor. This will be considerable, as it cost us over £20 per week last winter to get the coke removed and stacked; while we now have an up-to-date works, with new buildings and machinery, in place of the old tumble-down buildings and obsolete plant which they have displaced. So that, in our case, a progressive policy has most decidedly proved a good investment.

This summer we have put in two new purifiers, 25 feet square, of Green's type—utilizing the principals and slates off the dismantled retort-houses for the shed over them.

We have also installed a Maxim carburetting plant for enrichment purposes, and for checking the naphthalene trouble, which, I am sorry to say, the slopers have introduced into our district. Under the old style of working, we used to be troubled with naphthalene on the works; but now it has left the works and got into the district, which is worse.

Our holders and governors are the only other features calling for special mention, as they each possess peculiar features. They remain as I found them. Each holder has its own governor, which, besides regulating the pressure in the district, also acts as the outlet-valve—there being no other valves on the outlet-mains. This plan possesses advantages and drawbacks; its chief advantage being that it is not possible to shut the gas off the district.

Two of the holders have third lifts added on Gadd's principle; the spirals being on the inside of the middle lift of one holder and on the outside of the top lift of the other. When these top lifts had been added, it was found that the old bottom lifts were not sufficiently rigid to carry the added top weight. Wire ropes had consequently to be introduced to keep the holders from tilting. This shows the necessity for making sure that a holder is rigidly guided by the bottom tank rollers, and that the side sheets are properly stayed before adding additional lifts. In this case the actual working of Gadd's spirals has been quite satisfactory, although the spirals which are inside the holder, and cannot therefore be examined or seen, are a source of anxiety.

In conclusion, I must apologize for the discursive nature of these remarks, which, however, is intentional; the object being to provoke a good discussion, which is, after all, the chief object of the meetings of this Institution.

Discussion.

The PRESIDENT said Mr. Townsend had added to the obligation under which he had already placed the members by the clear description which he had given of the Wakefield gas-works. As many members had had experience of inclined retorts (he was sorry that he personally had not), they ought to have a good discussion on the subject.

Mr. J. F. BROMLEY (Batley) remarked that, as a Manager who had been connected with inclined retorts for something like three-and-a-half years, he thought he might say that he had had a fair share of experience. The experience he had in the first instance was not of a very satisfactory nature, arising mostly from imperfections, though the installation was put up by an engineering firm calling themselves the "Cocks of the North." With perseverance, they had got over their troubles; and they were now working under very satisfactory conditions. They had been enabled to reduce the cost of carbonizing, on an average, something like 1s. per ton—that was to say, the total cost of carbonizing under the old dispensation was 2s. 10d.; now it was 1s. 10d. However, this fact must not be lost sight of, that the initial cost was very heavy—about double; and the subsequent repairs and maintenance, he thought, would be (according to the experience he had had) nearly three times as much as in the case of horizontals. Notwithstanding all this, he felt satisfied, from his experience, that it was the class of carbonizing that would obtain in the future, particularly in works of the size of those with which he was associated. There was another strong point in connection with the inclined retorts, and that was that it freed them to a large extent from labour troubles. They had not so many men to deal with; and therefore they had not so many obstructionists, particularly in the winter time. In connection with this system of carbonizing, he could not go so far as some did with regard to the make of gas. His experience was that they had not made so much gas per ton of coal carbonized; and he did not think himself that it was done elsewhere. This was his candid opinion; and he would not believe his own father, if he were working in the next town, and said he was making more. He was satisfied it could not be done, and was not done.

Mr. R. HOOTON (Ashton-under-Lyne) said that, after a remark like the last one, he could not sit still. He had himself been working the inclined system for something like twelve months; and he could say nothing but what was good in regard to it. His experience of it was that it was the cheapest method of carbonizing. With generator settings, it cost him 2s. 3½d. per ton; and with inclines, he was doing it now for a small fraction under 1s. Then they were able to talk of their labour troubles disappearing under the inclined system. And why? Because they could put ordinary labourers to do the work. Ordinary labourers were quite qualified to manage inclined settings. Then, again, he was able to work the settings to full advantage in the summer months. He had got seven beds; and he was in a position to work six beds all the summer through, and the greater part of the past summer he worked all the seven beds. Therefore he thought he was qualified to speak, and to say that he had been working the system to the best advantage, while some others had not been in the position to do this. His experience was that he got a better make, a better illuminating power, and a considerable saving in coke, as Mr. Townsend had shown them. He was sure Mr. Townsend was to be congratulated upon his installation. The only thing he had to find fault with was the number of men that the author of the paper had to do the work on each floor. Now he (Mr. Hooton) belonged to Lancashire; and he thought that in Lancashire they were noted for getting as

much work out of a man as was possible. Mr. Townsend said he had for three beds one man on the charging-floor, and two men on the drawing-floor. In his own case, he was working much better than this. He had only one man on the charging-floor and one on the drawing-floor, and two coke-wheelers. Mr. Townsend, however, carbonized more per mouthpiece than he did, because his retorts were larger than those at Ashton. Mr. Townsend was carbonizing from 8 to 10 cwt. per mouthpiece. He (Mr. Hooton) could not give his exact figures; and, indeed, it was rather doubtful sometimes how much coal they did get put into the retorts. It was very satisfactory to see so many members present at the meeting. In his opinion, it was simply the inclines that had drawn them there. They had heard of many bugbears in connection with the system; but it was his firm conviction that eventually they would all have to come to inclines—they would have to come to the inclined system or to mechanical stoking. Now, as to the coal used. In his case he had three classes. To his mind, anyone who wanted to work the system to the best advantage must use screened coal. It would go down just like shelling peas. But if they got a mixture of cannel, burgy, and screened coal—well, sometimes the men had difficulty even in charging the retorts. He could not at all agree with Mr. Bromley's last remark. Whenever he heard of anyone going in for inclines, he always thought that manager was on the right tack. There was no doubt, when they adopted inclines, they had less men and less humbug. Anyone who had had any experience in the working of ordinary regenerative settings was able to manage inclined settings. But anyone who had only worked direct-fired settings would perhaps not get on so well with them for a bit. At the same time, any manager who wanted to go in for making plenty of gas, and making it cheap, should start inclined settings; and he would never regret it.

Mr. H. Hawkins (Todmorden) said he had had the inclined system at work now for about five-and-a-half years—he believed just before Mr. Bromley. As to Mr. Hooton's remarks, he could not follow him exactly. He thought he must have been reading some novelette or something of the kind. He (Mr. Hawkins) could not obtain such results as Mr. Hooton appeared to be able to obtain. In regard to labour, he believed the general practice throughout the country with inclined retorts was roughly one man per bed—that was to say, as Mr. Townsend stated in the paper, when they had three beds on, they should have one man on the charging-floor, and two on the drawing-floor. This was the rule at his own works. The men had to get their coke out, and they did all the work; and the number was increased by one man per bed as they went along. He must agree with Mr. Bromley that it was almost impossible to produce as much gas per ton of coal with inclined retorts as they could with horizontal ones. The quantity, of course, depended entirely upon the coal used. As far as the illuminating power went, he did not think there was any appreciable difference between the two systems. In his experience, the coal most suitable for inclined settings was screened nut coal. He was using screened nut coal at the present time, and had no difficulty whatever. He could get an average of 10,000 cubic feet per ton. He used no cannel, but had a water-gas plant which was utilized for enriching purposes. When they were carbonizing small coal—Mirfield slack—there was a great deal of creeping of the charges; but when they went to a good clean nut coal, there was no trouble at all in this respect. They could put it where they wanted it, and would find it there when the charge was burnt off. The only difficulty the men had was to keep the stopper in until the shoot was put in front; and they had to get out of the way smartly, or else the charge would be out on the top of them. The settings worked remarkably well; and he had no stopped ascension-pipes. He was pleased to say they had got over this difficulty. As in the case of Mr. Bromley, they had a little trouble at the commencement; but this had been overcome. At present they had six beds in use, in conjunction with their water-gas plant. As he said at a meeting in London a few years ago, he should like some of his friends who had inclined retorts in use to try thoroughly the system of taking the gas off at both ends. At the time of the meeting referred to, he had started a bed for the purpose of trying the effect of taking the gas out at both ends, with the hydraulic main at the top end, and also connected through to the foul main. With this one particular bed, he could safely say they obtained 400 to 500 cubic feet more gas than they did from the others; and it had been practically decided by his Committee to rearrange the other beds in order to make all of them work that way. He looked at it in this light: The earlier gases were taken off from the top. Some coals swelled a great deal more than others when being carbonized. After the coal had been in the retorts something like twenty minutes or half-an-hour, if they slackened off the bottom lid, they would find the coal had got to the top of the retort, and how was the gas then going to get an exit to the ascension-pipe? There was a great deal of carbon deposited in the retorts, especially in the top end; but in the one bed to which he had referred there was no carbon whatever, and the retorts were perfectly clear. This bed had been working four years; and he did not think there had been a hundredweight of carbon taken out of the bed during the whole of that time. It had only been renewed once since it was put in five-and-a-half years ago. The earlier gases were taken off at the top; and as the coke began to fall in the retort, the gas could, with the two ascensions, go which way it liked. He thought it was better to have two strings to their bow; and it made very little difference to the cost when putting in an installation. As he had said before, he considered horizontal settings were almost things of the past; and he quite agreed with Mr. Hooton that they would all have to ultimately come to inclines. There was no doubt in his mind about it.

Mr. W. Severs (Wilmslow) observed that Mr. Hawkins told them that by taking off gas at both ends of the retort, he found he got about 400 to 500 feet more gas per ton of coal carbonized. He should like to ask him what quantity of gas he obtained per ton of coal; what cannel he used; and what was the illuminating power.

Mr. Hawkins replied that he did not use cannel, as they had carburetted water gas for enrichment. He had tested the bed in question in the middle of the summer when he could have his holders full; and working the bed alone, he obtained from 10,300 to 10,400 cubic feet per ton out of the coal, with absolutely no cannel, while the others averaged just a little under 10,000 feet to the ton.

Mr. Severs: Were those horizontals?

Mr. Hawkins: No; inclines. The illuminating power in each case was just about 16½ candles.

Mr. J. W. Morrison (Sheffield) inquired whether, if Mr. Hawkins had stopped up one of the ascension-pipes, he would not have obtained the same results. Mr. Harman, of Huddersfield, in a letter in the technical papers, had advocated an ascension-pipe on one side only; and it was very likely when he (Mr. Morrison) remodelled his works that he would put the ascension-pipes all on one side. He had tried it; and the main was working beautifully cool. It was a thing gas engineers would have to consider, to do away with the stopped-pipe nuisance.

Mr. William Carr (Stalybridge) said they were getting too far away from Wakefield now. But he might just say in regard to this question of stopped pipes, that he fancied Mr. Harman believed he had made a discovery when he published his letter about having only one ascension-pipe. He (Mr. Carr) remembered that, when the late Mr. F. J. Evans designed Beckton, he started the works with one ascension-pipe to each retort. Mr. Evans was quite convinced it was the proper thing to do; but after struggling with one ascension, he eventually resorted to the old plan of putting in two—one at each end. If Mr. Morrison went further with his experiments, he would also come to the conclusion that having one ascension was not altogether the best thing to do. With through retorts, it was difficult to know whether or not one of the pipes was doing any good. But the chief question before them was that of inclined retorts. They had had a sort of battle royal between the users of these retorts; and the position he was still in was that of an inquirer after truth. (Laughter.) This was a very awkward matter at the present moment. He had come to the meeting with an open mind. He had believed there must be something in inclined retorts; and he had been trying to follow some of the voluminous correspondence in the "Journal of Gas Lighting," in the hope of getting a ray of light out of it. But his reading had been very unprofitable up to the present time; and he did not seem to get any "forrader" as it were. Coming to this meeting, he was more and more confused. They had first Mr. Townsend, who said it cost him in labour 1s. 3½d. per ton. Now there was a figure clear and distinct; but how much labour was included in that, it was difficult to know. Then they had Mr. Bromley, who said it cost him 1s. 10d. per ton. [Mr. Bromley: That includes everything.] Well, he hoped it did. (Laughter.) He supposed Mr. Townsend would say his included everything. [Mr. Townsend: I said in my paper what it did include.] That was quite true; but they would have to check some of the figures by a glance over the balance-sheet at the end of the year. Then Mr. Hooton, in a free-and-easy sort of way, said it cost him less than a shilling. They were not told to any decimal point what it really did cost him. He simply threw the statement out, "Less than a shilling." (Laughter.) That might be a 1d., or it might be 1½d. [Mr. Hooton: I believe that I said a fraction less than a shilling.] He (Mr. Carr) did not remember the word "fraction." Then Mr. Hawkins did not say anything about cost. He wisely left that alone. He told them how much gas he made per ton; and he raised a side-issue about two ascension-pipes, but he prudently avoided saying anything about cost per ton. These were the figures they really wanted to get at; and he was afraid they were floundering a little. Taking the statements made, the difference was nearly 100 per cent. If his "fraction" was considerable, Mr. Hooton was down to about half of what Mr. Bromley had said was his price. There was a wide variation between four gentlemen in the room who were using inclined retorts. They showed a difference of 100 per cent. in the cost of labour out of only three who gave any cost at all. The figures of the one man who had wisely refrained from giving them might even further exaggerate the difference. However, the paper Mr. Townsend had given to them, would afford food for thought; and to those who were interested in the subject, the author had supplied a lot of matter worth consideration. He had carefully compiled his figures; and he had stated the number of men employed and how they were employed, so that the members could, in a measure, check what Mr. Townsend had told them. He (Mr. Carr) should be very curious to know, and he should like to ask Mr. Townsend, when he had had a full year's working, how his labour worked out altogether—how much less his labour was, and how much more his maintenance was. These were things which must come side by side in the consideration of

this question. If they were going to put a large additional capital charge on to their works, and were going to put a heavy additional cost on to maintenance, they must have a large saving somewhere else. Whether or not the saving in labour was sufficient to compensate for the whole of the extra expenditure which was bound to be involved in other respects, they had at present nothing to guide them to a decision. If any gentlemen would come forward and could satisfy them on that head, many gas engineers would be much obliged. Then, if the balance was on the side of inclines, the time would arrive when, as Mr. Hooton said, they would have to come to inclined retorts. At present, however, he (Mr. Carr) did not see it.

Mr. Isaac Carr (Widnes) said, in regard to the question of cost, Mr. Townsend had not had the plant in use a sufficient length of time to give them a figure as to maintenance; but he must have estimated a figure, together with the interest on capital over and above an ordinary horizontal plant. If Mr. Townsend would give them what he himself had put down for his own guidance, they could then add this amount (because the figure whatever it was must be added) to the 1s. 3d. that he gave them as the sum saved. He should like to compliment Mr. Townsend on his really excellent paper, and also on the very excellent arrangement of conveying plant that they had had the pleasure of seeing that day. He had seen a good many different kinds of coke-conveyors; but he must confess he had never had the pleasure of seeing one working better, or more ingeniously carried out, than the one at Wakefield. He quite expected that the cross bars would have crushed the coke to a very considerable extent; and he took the trouble to go to the top of the outside conveyor in order to see for himself if this were so. He was surprised to see that the small pieces of coke were passing along to the place where they were dropped out without being crushed in any way. To him, the remarks of Mr. Hooton appeared rather extraordinary. He told them that one of the things to do to succeed with inclined retorts was to use screened coal. Well, there was some talk of the saving per ton of coal being something like 1s. a ton. If he had to put in an installation of inclined retorts, and followed the advice of Mr. Hooton in order to make them work, it would add to his cost for fuel no less than 6s. a ton. What they wanted to do as engineers was to use the best kind of coal in its cheapest form; not specially prepared coal—coal that had had money spent on it in cleaning it and getting it to a certain state for domestic purposes and so on. They wanted apparatus that would deal with the coal in its cheapest form, so as to sell gas at the lowest possible rate. He was just as eager as any gentleman present to reduce the manual labour at his works; but until he could see there was money to be saved by adopting such a course, he must continue, as he was doing, to use horizontal retorts. At the present time, he was unable to see that there was—when he considered the extra capital outlay, the extra interest on capital, and the great increase in maintenance—any saving over that of a good system of horizontal, regenerative fired settings.

Mr. A. F. Goodson (Heckmondwike) said he had a few questions he should like to ask Mr. Townsend. The first was as to the cost of carbonizing. In his paper, the author did not tell them whether the cost of 1s. 3·54d. included the elevator men, and all the cost of attending to the coke-handling plant. Then he would be pleased to know what the make per mouthpiece was, and how much per through retort. The only objection he (Mr. Goodson) had to the De Brouwer coke-conveyor was that it made an enormous quantity of breeze—such as he had seen in the yard; and he asked Mr. Townsend how he proposed to deal with this. Information as to the pressure which was found in the interior of the inclined retorts would also be useful. His next inquiry was as to whether Mr. Townsend did not (looking at the table he had read) find it more expensive to work five or six beds of inclines than to work two or three. In a works of his (Mr. Goodson's) size, in summer time he would only have to work one bed of eight through retorts, or sixteen mouthpieces; and he would like to ask Mr. Townsend what he would do with only one man to work them—whether the man would first discharge part of his retorts on the drawing-floor, and then return to the charging-floor to charge them. The next point might seem far-fetched, but he regarded it as one of importance. At Heckmondwike, they had been troubled with naphthalene over a long period. For a number of years, it had been the custom to flush out the hydraulic main with liquor; but now, on alternate days, he flushed it out with hot water from the boilers, making the bottom of the main perfectly clean. He asked whether Mr. Townsend had adopted a similar practice at Wakefield; and, if so, whether he had noticed any difference in the illuminating power after he had flushed out the main with hot water. At Heckmondwike, after flushing the main, the jet photometer showed an increase of nearly 0·7 candle; and there was also a temporary entire absence of naphthalene on the works. If he (Mr. Goodson) reverted to the old system of flushing with liquor, he found that the illuminating power of his gas went down more than ½ candle, and naphthalene reappeared.

Mr. Tim Duxbury (Middleton) said there seemed to have been a great difference of opinion among various users of inclined retorts. He had had some little experience with them; this being his fourth year of working inclines. With what he had seen that day at Wakefield, he was very pleased indeed. He thought Mr. Townsend had his heats in good condition, and had very nice charges. But he questioned whether he had got even 8 cwt. of coal into his retorts. But taking the plant as a whole, he considered it was working very satisfactorily. With respect to the coke plant, he would like to know if Mr. Townsend had so far noticed much wear and tear. It seemed to him (Mr. Duxbury) that, with the scraping business, the plates would very soon become worn through. The coke plant he (Mr. Duxbury) had was now working its fourth winter; and the plates were just beginning to wear. In his case, the coke rode upon the plates, or tumbled off at the end or at any part of the conveyor. There was no pushing about in any shape or form. There had been a good deal said as to the wear and tear on inclined retorts. As to his own retorts (he had six beds of eights, and this was the fourth winter they had been working), they had let them down for repair during the summer months—every other summer about—but they had not yet pulled out a single retort; so that, so far as the wear and tear on the retorts themselves was concerned, it was very moderate. As to the furnaces, they had not even relined any of them. They had reset the cross fire-bars; and that was all they had done, except the protecting of the retorts when they were let down in the summer. With respect to the coal-handling plant, they had had no repairs there. They had a 12-horse power gas-engine; and Thursday of that week was the first time they had had any repairs done to it, and then they only had Crossley's man over for a day. They had had a few new buckets put into the coal-elevating plant; but there had been nothing nearly so much in the way of repairs that they thought there would have been. So far as Middleton was concerned, he said distinctly, that the wear and tear on the retorts, according to the balance-sheet, was no more than they would have had with horizontals. There had also been a question as to the initial capital outlay. He did not think that was nearly so much as many people imagined it to be. They had only one ascension-pipe, one hydraulic main, one set of valves, and one foul main; while in horizontals they had two sets of these things, which meant double the expenditure in ironwork. The cost of the bricks, too, was practically the same. They filled up the bottom with a big main flue and partly solid brickwork. The setting of the retorts would be rather more; but it would be only a little more than the saving obtained in the ironwork. Therefore taking it all in all, there was not much difference. He was keeping the figures separate, so that he could get out the exact cost for the year of the inclined retorts and for the coke plant; and therefore he would later on be able to ascertain the actual state of the wear and tear generally. His candid opinion was that the wear and tear was very little more, and was hardly worth considering, seeing the tremendous saving they had in other respects. As to wages, taking their balance-sheet, the same items had been included every year—that was to say, they included in their carbonizing wages book the exhauster men, the coal elevator men, the coke elevator men, and the stokers who did all the cleaning out, and so on. With horizontal retorts, their carbonizing wages were 3s. 4d. per ton—that was, the total wages paid for making the gas according to the balance-sheet, with the foreman's wages included. With the inclined retorts, it averaged just 2s. per ton. Thus, with the whole of the wages included for the entire year, they had a saving of 1s. 4d. per ton; so that, in respect of carbonizing wages, there was a remarkable economy. A great deal had also been said about the make of gas per ton of coal and the illuminating power. Personally, his experience had been that they had not had any lower illuminating power, or a lower make of gas per ton of coal carbonized. They averaged 10,600 cubic feet last year. Of course, the make of gas depended on the coal. At Middleton they used Wigan four-feet coal chiefly, and a medium cannel, 20 per cent. say, for 19-candle gas. He had not noticed any depreciation of the make of gas per ton, or of the illuminating power. Nor did he think they ought to have any depreciation for this reason: The inclined retort system was partly on the Dinsmore process. Even to-day he was a strong believer that a great deal of benefit could be derived from the tar method of making gas, if they could only get to do the right thing. He had experimented a little upon it in the past summer, by only first half charging a retort. He left the half charge in two hours, and then put the top half charge in, and thus passed the gas from the latter over the lower portion, which was practically of a dull red heat. By this means, he had been able to obtain a better quality of gas by from 1 to 2 candles. His opinion was that the tar made passed through the retort in a gaseous condition over the coke in the lower part, and thus became gasified; and so if this was correct, they ought to get a better make per ton and a higher illuminating power. So far as his experience went with sloping retorts, he could not say they got less of either. He was inclined to say they got rather more. With inclined retorts, if they could use them with cannel, he thought they would get by far the best results. But he agreed with what Mr. Hooton had said. If they used (say) 20 per cent. of cannel, it did not always become equally distributed; and sometimes they got a rush of cannel down, and it caught towards the bottom of the retort. But he found by experiment with various kinds of coal, that, if they could use coal only, and have some independent method of enriching, they could get far better results. He had fixed a Maxim carburettor; and they did not purpose buying any more cannel after this winter. He got quite as good results from coal only as he did from coal and cannel, because he had better layers and charges, which were burnt off better, and so more gas was produced out of the coal. He was surprised to hear Mr. Hawkins say he got a lot of carbon

at the top end of the retorts. With a current of air sweeping through the retort, he had never experienced any deposition of carbon whatever, except a little down at the bottom of the mouthpiece. Certainly he had never experienced it at the top end of the retort on any single occasion. On the whole, he had learnt something from the visit to the Wakefield Gas-Works; and two or three things he had seen he should perhaps (after asking Mr. Townsend's consent) like to adopt. He felt sure most of them had learnt something from the visit; and personally he thanked Mr. Townsend for having invited them.

Mr. F. A. WINSTANLEY (Rotherham) said it seemed to him that a great deal depended upon the cost of carbonizing per ton. Mr. Bromley stated that carbonizing by inclines cost him 1s. 10d., as against 2s. 10d. by horizontals; and other speakers had made statements about their costs per ton. But they did not seem to have got at precisely what that cost included. In different works, the engineers had different methods of calculating their cost per ton of coal carbonized; and the consequence was that some appeared to be carbonizing more cheaply than others, though they might not really be doing so. But still their statements were detrimental to those who were apparently carbonizing at a greater expense. Therefore, he should like to know from Mr. Bromley whether his 1s. 10d. included elevating and conveying.

Mr. BROMLEY replied that his 1s. 10d. included everything—that was, elevating plant, foreman, and everything connected with the retort-house. Simply taking the figure for stoking alone, it was 1s. 4d., as against 2s. 3d. under the old dispensation; or, taking it the other way, it was 1s. 10d., as against 2s. 10d.

The PRESIDENT said they had had a most interesting discussion; and various opinions seemed to have been brought out. Personally, he had had no practical experience of the working of inclined retorts, though he had seen the chief installations in the country. While he thought they might be suitable for smaller works, he was a long way yet off being convinced as to the advisability of adopting them for large works, in which they could keep a retort-house and a set of power-charging machinery fairly constantly employed. This condition, however, did not apply to many of the members' works, and therefore did not interest many of them. He was sure it was exceedingly difficult to reconcile the various statements which had been made there that afternoon. He must say that he agreed with Mr. Carr as to the hopelessness almost of trying to get to the actual cost of carbonizing by inclined retorts. Many engineers did not include prices, for the very good reason that they had not had sufficient experience of the cost of wear and tear, and not many of them knew what it would amount to. He must confess that he was rather surprised to hear that the adoption of inclined retorts was a certain cure for labour troubles. He knew of at least two works in which the introduction of inclined retorts had been the cause of some serious labour troubles; and he did not think they had finished with such difficulties when they introduced inclined retorts, more especially in large works.

Mr. TOWNSEND, in reply, said he had been much gratified with the discussion, though it had rather ran into a channel which he did not exactly wish for, and that was the relative advantage of stoking by means of inclined retorts and other systems. His paper did not touch on that point at all. It was simply a description of the inclined retorts at the Wakefield Gas-Works; and he gave reasons in his paper why he adopted inclines. Then, again, several speakers had found fault with his figure of 1s. 3·54d. for labour, because it did not include the items dealing with the coal. He was making a comparison between their style of working under the old method of hand charging and the style of working by inclined retorts; and so he was bound to take the same items. As in the past, the coal had been debited to coal and not to carbonizing wages, he was bound to treat it in the same way with inclined retorts. Mr. Bromley gave the figure of 2s. 10d. for carbonizing with his old retorts, and 1s. 10d. for the new. There was a difference of 1s. in favour of inclines. In his own case, the difference was 1s. 3·28d.; and, like Mr. Bromley, he had taken the same items for his old retorts as for the new. It was utterly impossible for them to get a figure that was applicable to every case, because they were bound in dealing with this matter to take figures from the balance-sheets; and it depended upon what had been the practice in their respective works in allocating the different items. Therefore, it would be a long time before they obtained figures that would correspond in all the works in the country. He did not know whether Mr. Bromley meant to include him when he said that he did not believe anybody could get more gas per ton of coal with inclined retorts than with the old settings. He (Mr. Townsend) gave chapter and verse for his figure here, and they were the balance-sheet. In his case, they could compare inclined retorts and bad horizontal retort-settings, charged by hand. If they compared inclined retorts with the best settings of horizontals, the comparison was different. He simply compared Wakefield with Wakefield. Mr. Hooton found a saving of 1s. 3d. per ton—the same as he did himself; and he also claimed that he realized a better make per ton and a better illuminating power than before. Mr. Hooton also made a remark about the men he (Mr. Townsend) had on this work. He said that in his own case one man did the work of charging the retorts for seven beds, and two men drew the retorts. He did not know what style of working Mr. Hooton had—whether he had twelve or eight hour shifts. [Mr. HOOTON: Eight-hour shifts.] Eight-hour shifts entirely spoilt the comparison, because his own at Wakefield were twelve-hour shifts. Therefore they could not compare the two. Then, again, his (Mr. Townsend's) retorts were very large—26 in. by 16 in. at the discharge end; and Mr. Hooton's, he presumed, were of a smaller size. So it was utterly impossible to compare the two. He (Mr. Townsend) had made the best terms he could with his men; but perhaps Mr. Hooton had been able to make better. Then there was a reference made to screened nuts for slopers. He agreed with that. There was no doubt that slack was not satisfactory. Inclined retorts practically debarred unscreened coal, as the retorts did not like dust. If they were charged with coal containing a considerable amount of dust, the charge would not run down the retorts. The dust fused at the top of the retorts, and stopped the men getting the charge in. An engineer must take this point into consideration before he put in inclines, and took out his horizontals. He (Mr. Townsend) held no brief for slopers; but he had simply described what had been on view for the members that day. Then he thought most of the other speakers had torn one another, and thus had deprived him of the privilege of comparing their remarks. Mr. Goodson asked him a great number of questions; and he did not think he could answer all of them off-hand. His wages did not include the elevator men or the men who dealt with the coal, for the reason that in his former style of working they were not included. The make per mouthpiece was about 8000 cubic feet—about 16,000 cubic feet per retort. He had already made arrangements for disposing of the breeze made. He had obtained a contract for the breeze; and he was trying to devise some method of getting it screened and cleaned by means of power. This was still under consideration; so that he could give no particulars about it at present. He was very gratified to hear that Mr. Tim Duxbury (who had had so much experience with inclined retorts) was pleased with the Wakefield installation; and also that he realized a good make per ton with the installation at Middleton. He could only conclude by thanking the members for their splendid attendance, and the interest they had shown both in looking over the works, and discussing his paper.

Mr. ISAAC CARR reminded Mr. Townsend of his request for the figures he had taken for his guidance in regard to the additional capital cost and the cost of maintenance for inclines compared with ordinary horizontals.

Mr. TOWNSEND replied that he did not consider that question, and so could not give any figures.

The PRESIDENT said, before asking some one to propose a vote of thanks to Mr. Townsend, he should like to express his appreciation of the paper, and the trouble the author had taken in putting all the facts before them. Of course, the remarks he (the President) made with regard to inclines generally had reference to the discussion that had taken place, and not to Mr. Townsend's paper. They were all of one opinion that, under the circumstances in which Mr. Townsend was placed, and the peculiar nature of the site, that he had adopted the only possible course, and had carried the work out in the very best manner. Mr. Townsend had given them a clear description of his plant; and he was not in any way responsible for the opinions expressed by other gentlemen present, who were certainly not altogether harmonious in their views. (Laughter.)

Mr. R. G. SHADBOLT (Grantham) proposed a vote of thanks to Mr. Townsend for his paper, and for the great attention and hospitality that he had shown the members that day. Reverting for a moment to the discussion, he must say that he felt glad he had not adopted inclined retorts. After seeing Mr. Townsend's works and hearing his paper, he thought that, after all, there must be something in inclined retorts; but, when they considered the conflicting statements they had heard, many of them could not help feeling that they had escaped from a difficult situation in not adopting them. Mr. Townsend had dealt with the matter in a special manner for special conditions; and what he had done had been done in the best possible way to meet his own particular circumstances. The work would redound to the credit of the Company and to the entire satisfaction of the Directors.

Mr. ARTHUR GRAHAM seconded the motion, which was unanimously carried.

Mr. TOWNSEND made a brief acknowledgment.

CONTROL OF CHIMNEY DRAUGHT.

Owing to the discussion on Mr. Townsend's paper having consumed so much of the time set apart for the technical matter on the programme, it was decided to postpone to the next meeting the paper by Mr. E. H. HUDSON (Normanton) on the subject of "The Control of Chimney Draught."

METHOD OF ELECTING MEMBERS OF COMMITTEE.

Mr. SEVERS said, in order to avoid the little bit of ill-feeling which was exhibited at the last February meeting with regard to the election of members of the Committee, he wished to propose that in future they be elected by ballot as in the case of the Gas Institute.

A question being raised as to whether the rules admitted of the mode of election being altered,

Mr. S. S. MELLOR (Northwich) stated that the rules said the members of the Committee should be elected at the annual meeting in February, except the President, but did not prescribe what method should be adopted in making the election. If the members decided that the Committee should be elected by ballot, they could do so by simply voting on the point.

Mr. HOOTON seconded the motion.

There was a little conversation on the subject, in which Mr. W. W. HUTCHINSON and others took part.

The PRESIDENT pointed out that it would be quite irregular to alter the rules without notice of motion; and Rule 11 would have to be modified before the motion could be considered.

[Rule 11 says: "All questions to be decided by any convenient system of open voting; the Chairman to have a second or casting vote when necessary. Questions of a personal nature, other than the election of members or officers, shall be decided by ballot."]

Mr. SEVERS said he simply wanted to avoid the unpleasantness they had at the meeting last February.

The PRESIDENT said that notice must be given; and the matter taken up in a regular way at the annual meeting.

This concluded the business proceedings; and, after taking tea together, the members separated—one and all highly delighted with their visit to Wakefield.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

A Meeting of the Association was held last Saturday at the Manchester Technical School—Mr. C. BERRY occupying the chair.

The SECRETARY (Mr. E. J. Wellens) stated that their President, Mr. S. E. Halliwell, of Littleborough, was attending the meeting of the Senior Association at Wakefield, and was therefore unable to be present. He had, however, sent a letter expressing his regret that he could not attend the opening sessional meeting, as he would have liked to hear the paper which Mr. Casmey was to read on a topic which was at the present time of extreme interest to the gas industry. He hoped they would have a successful meeting. He wished also to thank the members for electing him to the position of President—an honour he appreciated at its full value; and he assured them he would do his utmost to further the objects of the Association, in which he took the greatest interest. He hoped that each member would do all in his power to supplement the efforts of the Council in the working of the Association, and that the ensuing year would be marked by the success which had characterized the efforts of the past few years. That their organization justified its existence could not, he thought, be doubted. The success which had attended their efforts proved to him the need of such an Association; and he felt certain that if similar Associations were formed in other parts of the country, at convenient centres, it would not only be beneficial to the members themselves, but also to the industry as a whole; for every opportunity ought to be given, and taken advantage of, to raise the standard of efficiency in the junior members of the profession. Especially must they recognize the value of such means of education when they considered that their industry was now by no means a monopoly, and that the near future would undoubtedly see great improvements and changes in the present methods of lighting and heating. The electricians would be on the alert in providing every possible inducement to their consumers; and if they (the members) were to succeed in holding their own, it behoved them to study carefully the most modern methods of production and distribution, to familiarize themselves with processes that would tend to establish their particular works on a more economical basis—in short, to embrace all means whereby they could extend their knowledge—in order that they might fit themselves to creditably fill the higher positions to which they naturally aspired. He thought they might fairly claim that their Association had such an educational tendency, for they benefited not only from the papers read and the visits arranged from time to time, but also from the interchange of experience which was rendered possible by their meeting under the auspices of the Association. The diffusion of knowledge in this way was bound to have an elevating effect. In conclusion, he again expressed the hope that they would have a successful session.

Mr. CASMEY, representative of Messrs. Keith, Blackman, and Co., then read the following paper, and exhibited the Keith compressor and burner, with the ordinary incandescent and common gas-jet for purposes of comparison:—

HIGH-PRESSURE GAS LIGHTING.

The subject before us this evening may, I think, be safely called the acme of artificial illumination; but its value will be better understood by taking a rapid survey of the lighting of the past, and comparing it with the present high standard of efficiency. Far back in the ages, we read of oil-lamps being used; and proof of this we find in many different quarters where old ruins have been brought to the surface. The Ancients, however, never appear to have employed anything but tallow or oils for their illumination, although in many cases Nature made every effort to call their attention to the buried sunshine by causing the gas from coal to escape on the earth's surface; and this accidentally being fired was only thought of as a natural phenomenon. Towards the close of the Eighteenth Century, however, William Murdoch brought his mind to bear on the subject, with the result that, after various experiments, he succeeded in giving to the world one of the greatest blessings known to mankind—a power which makes work possible during the night as well as the day, practically the opening of a page of the past which enables mankind to live in the sunshine which was stored up for him by the Creator millions of years ago.

I have had a wide experience of the various industries in the United Kingdom; but there is none so fascinating as that of the gas engineer. He appears to me as a magician. The coal is brought to him from the mine; and, to look at, it appears lifeless—merely pieces of black rock. Under his skill, however, the light and warmth of the sun of ages ago are given out for man's benefit. The perfume and colours of the flowers of the past are also brought back to life; the natural oils are collected from that dull, black mass; and the mechanical power of the sun is brought again to life in our gas-engines. The picture can be carried still further. The gas-engine drives the dynamo; and wires are carried to the various parts of a large works, and small motors driven for all kinds of industrial purposes. In other words, the rays of the sun before the time of man are now utilized for his benefit. We can even go further still, and find that the waste from gas-works is the best fertilizer of the earth, and crops under treatment with it yield greater returns than by any other method.

As one who knows some little of the practical side of engineering, I would say that the gas engineer holds a unique position among men. If the millions of tons of coal we waste yearly in raising steam and attempting to warm our homes were passed into the gas-works, and gas instead of the raw fuel used for warming or steam-raising purposes when necessary, the atmosphere of the large towns would be much clearer than at present, and more than double the value would be obtained from the fuel used. From Murdoch introducing gas lighting in 1798, many wonderful inventions have been introduced for purifying, &c. These are fully described by Mr. Newbigging, in his excellent "Handbook for Gas Engineers and Managers."

For the first half century, the gas engineer had little or no competition. Then we find electricity brought forward; and the battle for light went on for some considerable time, when electricity appeared to be firmly established as the light of the future. Many gas engineers seemed to lose heart, and were inclined to remain passive; but others, with more fight in them, continued to make effort by improving their manufacturing plant and enriching the gas with various substances. In 1887, the Welsbach burner and mantle were introduced; the spirits of the gas world went up; and the battle "Gas *v.* Electricity" again commenced. Dynamos and lamps were improved so that more light was secured for a given horse power.

About four or five years ago, several attempts were made to produce apparatus for compressing gas taken from the street-mains, and serve this to special burners and mantles. Water pressure was the means generally adopted for the purpose; but owing to defective construction, so much water was used to work the compressors that, although better lighting was secured, it was at such an enormous expense that the high-pressure system would, no doubt, have been discarded, but for the invention of a suitable compressor by Mr. James Keith, the Chairman of the James Keith and Blackman Company, Limited. Since that time, gas has taken the premier position for lighting large open spaces, and also for lighting works of various kinds. One of Keith's smallest compressors we have here for inspection, and from which the burner is being supplied. Here we have an opportunity of comparing the ordinary gas-jet, the incandescent, and the high-pressure system; the illuminating power per cubic foot of gas being respectively 5, 15, and 33 candles.

The Keith compressor is worked from either the ordinary street pressure or from a cistern, is automatic in operation, acts as a governor as well as a compressor, uses very little water (about 1½ gallons for every 10 cubic feet of gas compressed), and has the approval of the water companies. In operation it is silent, has practically no visible movement, and is devoid of friction in the air and gas pump portions, which require no packing-leathers or oiling. It can be placed in almost any position with safety, and gives an unvarying pressure without any pulsation. The apparatus has been examined by many competent engineers; and all agree that it is the most perfect and economical of its kind. For high-pressure lighting or compressing air, for the better combustion of acetylene gas, or any other purpose, the apparatus has no equal; and being so economical in consumption of water, this need not be taken into account. At 7d. per 1000 gallons, over 30,000-candle power per hour will cost about 1d.

The compressor consists of a reciprocating water-motor acting directly on a practically frictionless double-acting pump, which takes the gas from the main, and forces it into a small holder weighted to the desired pressure, which, in the present case, is about 8 inches. This holder is arranged so as to control the water supply to the motor, shutting it off as it rises, and opening the supply as it falls. The apparatus before us will compress as a maximum 150 cubic feet of gas per hour, equal to about 5000-candle power.

In all other machines for the same purpose, the principal trouble has been experienced with the pump portion; the work done in overcoming the friction of the piston and glands of which amounted to more than the actual work performed in raising the pressure of the gas, even when kept well lubricated and fairly slack, to say nothing of the trouble arising after being in use for a time, owing to leakage of gas at the glands and piston and clogging with dirty oil. The above troubles are overcome in the Keith apparatus, by using, instead of a fitted and packed piston, a small holder or bell working in a deep annular water-seal. This gives at once an absolutely tight piston, with no friction, and requiring no lubrication or cleaning. The top and underneath portions of the pumping-bell are each connected to suitable inlet

and discharge valves, so arranged as to make it double acting. It is therefore apparent to the practical mind that, by doing away with the friction of the piston and gland of the pump, the power required to do the work of raising the gas pressure is reduced to a minimum. In cases of works where it would be inconvenient to adopt the water-motor, the apparatus can, by a slight modification, be operated from any existing source of power, with the same satisfactory results.

The Keith compressor is used by several gas lighting companies, including the Intensified Gaslight Company, the Welsbach Incandescent Gaslight Company, and the Atmospheric Gas Company; and the members will all have an opportunity of seeing it in operation on the Manchester Infirmary Esplanade to-night, where it has been installed for about six months.

In Manchester and district alone, during the last few months, our system of high-pressure gas lighting has been applied by about a dozen firms; the total amount of light being nearly 300,000-candle power. In one case, Messrs. Crossley Bros., the well-known gas-engine makers, have 18 three-cluster lights; and these replace 40 arc lamps and 78 ordinary gas-jets. Messrs. Crossley Bros. are well satisfied with the installation, and have paid us the greatest possible compliment by giving a repeat order. Messrs. Royles, engineers, of Irlam, have also installed the light throughout their new works, 5 acres in extent, with the most satisfactory results; and only a day or two ago we received the order for two large compressors for lighting the Bury Market. I merely give this information to enable you, who are studying the interests of the community, to judge in what direction the leading firms are looking for the light of the future.

A most important adjunct of a good high-pressure lighting installation is the Keith burner. Like the compressor, it has two splendid qualities—simplicity and efficiency; and it is quite free from the musical attainments many other burners possess. Personally, I have tried in every way to make the burner whistle, but have failed; so that there is no danger, when it is used, of the objectionable noise so often complained of in other types.

Now a word or two anent the possibilities of high-pressure gas in other directions than lighting. I have, during the past few weeks, made several experiments in applying it for heating pressing-irons for clothiers. With the ordinary box-iron heated by means of a bunsen burner, the time taken to heat the iron was 30 minutes. When a small nipple was fitted with a bunsen, and high-pressure gas used, the iron was heated in 8 minutes. The solid irons were then treated, and the time reduced from 30 minutes to 7 minutes, Wishing to have something still more reliable, I had the compressed gas applied to a large stove, using nipples of very small bore, about 1-64th inch in diameter. In the stove a vessel containing water was placed, and arrangements made for taking the temperature of the water every five minutes. The total results were that in 17½ minutes the water was at 210°. The ordinary bunsen was then applied; and the time taken to heat up the same volume of water to 210° was 65 minutes.

Further experiments were made with pressing-irons where the bunsen gets its air supply from a small pressure fan. The bunsen often fires-back; and the result is that the irons soon become choked with soot. Dispensing, however, with the pressure fan, and only using the high-pressure gas, there is not the slightest trouble. The irons are kept at a constant temperature the day through; and at the close of the day the insides of the boxes are quite clean. From this we find that the compressor can do away with the pressure fan, as used very largely in our laundries and clothing factories, and in its place supply, without noise, a cheaper and more efficient apparatus, and one that can be applied where there is no other power than water pressure.

The possibilities of high-pressure gas are beyond conception. We may, as before implied, find that the gas-works are the sources from which both light, warmth, and cooking for our large towns are drawn. The pressure may remain as at present in the mains, but compressors be used where more light or heat is required.

In conclusion, is it not possible to send gas into the mains of a poorer quality—say, instead of 19 candles, 14 or 15 candles? This would mean an increase in the amount of gas per ton of coal of nearly 20 per cent.; and to increase the power of illumination, the compressor could be used. It has been proved now many times over that high-pressure gas has come to stay. No other light so nearly approaches daylight; and for dye works and print works, it is invaluable, as the colours are given as true as on the brightest day.

You gas engineers and managers have a duty to perform. It is in your power to give, by means of high-pressure gas, both a cheaper and more efficient light. You can supply power, both to cook and warm, for the thousands of homes in our large towns; and, by so doing, you bestow one of the greatest blessings on mankind—a clear atmosphere. For when the domestic chimney ceases to pour out its constant streams of smoke, fogs will be things of the past.

Discussion.

Mr. CHANDLEY (Warrington) said no mention was made by the author in his paper of the amount of pressure it was advisable to use—whether it was 8 inches, which he (Mr. Chandley) believed was the usual pressure, or whether 18 inches would not be better; and if not, why not. With regard to the heating of irons and gas-stoves referred to in the paper, he scarcely agreed that high-pressure gas would heat more quickly than low-pressure, *pro ratâ*. The higher pressure did not, in his opinion, increase the calorific value of the gas. To obtain an accurate comparison, they would have to know the consumption of gas in each case to do the same amount of heating in the given time. With respect to the suggestion that low-quality gas might be passed through the mains, and the pressure raised so as to increase the heating power of it, he did not see, as he said before, how the greater pressure would mean increased calorific value, as the heating power was almost proportionate to the illuminating power. As to the statement that with the incandescent light, the colour of materials, &c., was practically the same as in daylight, he might say that, so far as he knew, the high-pressure gas, like the ordinary incandescent system, always imparted to things a green or yellow effect.

Mr. CASMEY remarked that the general pressure used was 8 inches; the reason for not going up to 18 inches, or even higher, being, he assumed, that up to the present the mantle makers had not been capable of producing a mantle to stand a higher pressure. The difference in lighting and heating power in the various systems of gas lighting turned on the proper mixture of gas and air so as to get the best consumption; and the reason he took it for getting a better light with the high pressure than with the ordinary incandescent system was that they had a better mixture of gas and air. The mixture was 5 to 1, against (say) 3½ or 4 to 1 in the ordinary incandescent light. With reference to colour effects, according to the statements of those who had used high-pressure gas light, it gave the nearest approach to the effect of daylight.

Mr. MITCHELL asked whether it would not be better to have the light enclosed in a glass globe with prismatic faces, so as to split it up and diffuse it more, instead of having it concentrated.

Mr. CASMEY said that in almost every case where the light had been installed special lanterns or lamps were used for the purpose. There were many reasons why it should have a glass round it, particularly (say) in an engineering shop, where the glass would prevent chips coming in contact with the mantle. He had noticed, with a cluster of three burners, that the light was more agreeable to the senses when used in a lantern than without one.

Mr. BUTTERWORTH asked how they overcame the variations of pressure.

Mr. CASMEY said they had a bigger supply going into the compressor than they were taking out; and there was not that fluctuation which might be naturally expected. They had always more pressure than the light could take. Any fall in the reserve was so slight as to be scarcely noticeable.

Mr. F. WEST asked what was the cost for upkeep of the burner, for mantles, &c. He thought the intensified gas system had come rather as a "staggerer" to the electric light people, and might have the effect of making some of the corporations think twice before introducing electric lighting. The public wanted a good light. Up till lately, the electric arc held the field; but it seemed to him that intensified gaslight would supersede it. He understood that the incandescent gaslight pierced farther in a fog than the electric arc, and that the ordinary flat-flame burner was better than anything in this respect, although it had not the illuminating power of the intensified light.

Mr. CASMEY said that at the Glasgow Exhibition the life of the mantles was from nine to eleven weeks. At the time of their visit to the Manchester establishment, six weeks ago, he put some new burners on the lantern over the door. The mantles were still on, and they had been burning every night.

Mr. GARLICK said he was acquainted with the installation at Messrs. Royle's works at Irlam, where by means of Keith's compressor, they were able to get adequate illumination, notwithstanding that there was a great difference in level between the gas-works and that particular locality, and that, apart from the compressor, there was very little pressure. He was under the impression he had seen it stated that they could get a better effect from gas of low illuminating power on incandescent lights than from gas of high candle power. He thought Mr. Chandley was wrong in saying that the heating value of gas increased as the illuminating power.

Mr. CASMEY observed that with the more general adoption of electric lighting for public buildings, schools, &c., their business in electric fans for the ventilation of such buildings had greatly increased. In places where gas was used, the electric light was installed, and this represented practically a sealed box, giving no ventilation whatever. Consequently, they had to put in electric fans to ventilate places which the gas had ventilated before. They knew that the air was charged with germs. Now, with a burner like the one he had been describing, they had a means of keeping up a constant circulation of air in the room. It fouled the air, he admitted; but the question was whether the fouling from the gas-jet was more injurious than the breathing over and over again of the germs of disease which were present in a crowded room. He had had twenty years' experience in the heating and ventilating engineering business; and he certainly thought that, for health purposes, gas was a long way in advance of electricity, which was all very well in its place, and was for supplying power, and not for lighting.

Mr. THORP asked what was the consumption of gas in the burners and stove used to raise the water up to 210° Fahr. He said he had been trying some experiments with mixtures of gases; and they certainly indicated that increase of light and heat was a matter of more perfect combustion. It had been suggested that they might have 18 inches pressure. He found that Mr. Onslow, of Woolwich, was using about 54 inches, and hoped to obtain a light of about 2000 candles, when he could get mantles to stand

that pressure. Even from the mantles now available, he found it quite possible to get almost 2000-candle power.

Mr. CASMEY explained that the conditions with reference to the boiling of the water were that the same quantity of gas was used in both cases.

Mr. MITCHELL asked whether crude water gas could be used with the system.

Mr. CASMEY did not see why it should not be applicable.

Mr. THORP: With a specially constructed burner.

Mr. CASMEY said the nipple inside the burner must be of a different size for Manchester, Salford, and London gas.

Mr. MITCHELL thought the specific gravity of the gases in these places might account for it to some extent.

Mr. BARBER observed that, while the specific gravity might have some effect, he thought the difference in candle power was the principal reason. As to the variation in calorific value, he found that, while increased illuminating power was accompanied by higher calorific value, the difference proportionately was not very great.

Mr. SMITH said that, according to tests made at Bury, it appeared that while with high illuminating power they obtained slightly better calorific results, the number of calories per candle was very much lower. There was a greater calorific value per candle with low-grade than with high-grade gas.

Mr. GINMAN said he thought there was room for improvement in the burner used with the new system, so as to render it less noisy. The question of intensified gas lighting opened up a wider field than that involved in putting down compressors in various parts of a district; and he thought the time would come when the gas would be sent from the works at not less than 10 inches pressure.

Mr. GARLICK proposed a vote of thanks to Mr. Casmey for his interesting paper and exhibit.

Mr. HILL (Stalybridge), in seconding the motion, said that they had a compressor on order at Stalybridge, and he would be able to give the members the results on some future occasion of his experience of intensified gaslight.

The motion having been cordially adopted,

Mr. CASMEY, in responding, informed the members that it was fifteen years since he came to Manchester to work for Messrs. Blackman. That day was his last in Manchester, as he was to commence on Monday his duties in Leeds for Messrs. Keith, Blackman, and Co. He could therefore say that his last act in Manchester was to do what it was everyone's duty to do—leave a light behind him.

The proceedings then closed.

Private Bills for Next Session.—Attendance was given at the Private Bill Office, Westminster Hall, on Saturday evening to receive plans, &c., in connection with Private Bills to be introduced next session. The total deposits numbered 318, including 174 Provisional Orders. The total compares unfavourably with that of last year, when it was 362, inclusive of 199 Orders.

Municipal Sanitation in the United States.—According to a review of a work by Dr. C. V. Chapin, the Health Superintendent of Providence (R.I.), bearing the above title, in the current number of "Nature," Boards of Health in America, which are now established in all States except Georgia, Idaho, Montana, Oregon, and Wyoming, are endowed with more or less legislative and executive authority in matters which experience has shown they can best control. But, as a rule, the State Board of Health is considered chiefly as an advisory board. In the matter of water supply, there appears to be little room for doubting that more than one-half of the water furnished in the United States is wasted, for the consumption per head in America is twice as great as in European cities. In the few American cities which are metered, however, the consumption per head is not one-half what it is in the unmetered cities. It appears to be the experience in America that meters diminish waste, but do not limit the legitimate use of water.

Spontaneous Combustion of Coal.—In the course of a paper on this subject read at the United Service Institution last Wednesday by Commander Caborne, C.B., R.N.R., he referred to the report of the Royal Commission who investigated this matter in 1874, and remarked that it seemed to have been generally understood as condemning the shipment of all wet coal; but he pointed out that one paragraph showed that there was not a wholesale condemnation of the carriage of wet coal, but rather of the carriage of wet coal containing much pyrites. Alluding to the work of the Commission appointed by the New South Wales Government in 1896, Commander Caborne said the Commissioners considered that it had been disproved that the oxidation of pyrites was the initial cause of spontaneous combustion, and expressed the opinion that moisture had no effect in promoting it. A very important condition was the initial temperature of the coal; a high initial temperature tending to accelerate the rise of temperature. Another Commission appointed in New South Wales in May, 1897, came to the conclusion that coal was less liable to spontaneous combustion when loaded wet than when loaded dry. But although this fact had been demonstrated, there were practical difficulties in the way of carrying coal wet. He suggested that a regular and uniform method of taking temperatures daily should be adopted, and concluded with a description of a method of preventing or extinguishing fires by means of sulphur dioxide gas which has lately been brought out.

AMERICAN GASLIGHT ASSOCIATION.

Annual Meeting at Boston.

The Twenty-Ninth Annual Meeting of the Association was held at Boston on Oct. 16, 17, and 18, and was in every respect a success. The President, Mr. Ed. G. Pratt, of Des Moines (Ia.), occupied the chair. The official business included the election of 48 active members and 25 associates, which brings the total number to over 600. The report from the Trustees of the Gas Educational Fund was then presented (see *ante*, p. 1302); and afterwards, the President read his Inaugural Address, which has been reproduced in the "JOURNAL" in full (*ante*, p. 1242).

The Committee on Uniform System of Accounting presented a report, which set forth that an efficient system of book-keeping should provide complete, self-explanatory records of all business transactions, be capable of showing the final results of the business for any selected period, and furnish ready means at all times for the exact analysis of operating expenses and the location of all uneconomical methods. Too often entries were only understandable by those who made them, and something was left to memory. Supplementary statistical books were required in addition to the ordinary forms of account, and the system must be comprehensive, so as to be capable of general adoption. It must provide for the uniform analysis and comparison of accounts, step by step through the works, the streets, and the office. This absolute uniformity was difficult of attainment by reason of the great variety of local conditions and the general difficulty of securing a uniform interpretation of all rules and instructions. The natural basis for a system of operating accounts should be the division of the expenses through a sufficient number of items to facilitate an accurate analysis of the cost of manufacture, of distribution, and of incidental expenses; and the Committee proposed to issue to all the members, before Jan. 1 next, a series of tentative recommendations, and to request that criticisms of the same should be sent to them before April 1. They would then submit at the next meeting a classification schedule with instructions for journalizing, forms for vouchers, pay-rolls, store-room records, &c., necessary for the carrying out of the system. They hoped also to be prepared with forms for monthly or annual statements of cost and profit. They proposed, first, to prepare a senior classification schedule suitable for the larger companies, and, later, a more simple form for the use of smaller companies. The general divisions proposed would be: (1) Manufacturing, to include cost of gas at the outlet from the works. (2) Distribution, cost from the works to the outlet of the consumers' meters. (3) Commercial expense, cost of inspecting meters, collecting, and office work. (4) Incidentals. (5) New business, advertising, canvassing, and expenses in extending business. Under each heading there were sub-accounts, or items similar to those in the model form of account prescribed by the Gas-Works Clauses Act, 1871, with full general directions as to the scope and items chargeable to each, in sufficient detail to enable any employee to determine to what account any particular item is chargeable. In regard to extensions of capital, especially in new mains, the Committee recommended that records should be kept showing the estimated cost and the probable income to be secured, as it would be a distinct advantage to be able to compare the estimated with the actual cost; also that records be kept showing the cost per yard of each size of main laid complete. A comprehensive system of store-room records was a great desideratum; and the Committee recognized that care must be observed to secure a system that would be efficient but not cumbersome. Mr. Shelton moved the adoption of the report, as an important step towards securing a uniform system. He emphasized the importance of a simpler form of account for the use of small gas companies. It should be made so clear, condensed, and simple as to commend itself. The small companies were disposed to avoid elaborate book-keeping; but he thought none could fail to see the desirability of a simple and practicable form of account. Mr. Nettleton eulogized the work of the Committee, and spoke of the importance of keeping accurate store accounts. After some months' experience, he found that neither the work nor the expense was so great as he had anticipated; while the results were extremely satisfactory. Mr. Egner said the report was a move in the right direction; and having had some experience, he was sure the adoption of the proposed system would be easier in practice than might appear at first sight.

Mr. Frank D. Moses, of Trenton (N.J.), read a paper entitled "What is the Business of a Gas Company?" He said that a badly-managed gas-works was a burden to itself and an indirect injury to the trade; and that it was easier to build a works, and to make gas, than to find a market for the same. The most important end of the gas business related to its sale rather than to its production. Some years ago, he was employed to investigate and report on the removal of a gas-works to a new locality, and the cost of the proposed new works; and he was surprised to find that the management was exceedingly great in everything that contributed to the minimum cost of gas, and exceedingly small in everything that contributed to maximum consumption. Very few cooking-stoves were in use, many streets had no mains, and the consumption per head was small. His report nearly got him into trouble; for he found the old works were in fair condition, and had some reserve capacity. So, instead of spending £6000 or £7000 on new works, he advised a few inexpensive improvements, and a liberal extension of mains, services, meters,

[*Supplement to the* JOURNAL OF GAS LIGHTING, *&c.*, *Dec.* 3, 1901.

THE GASHOLDERS AT THE VIENNA NEW GAS-WORKS.

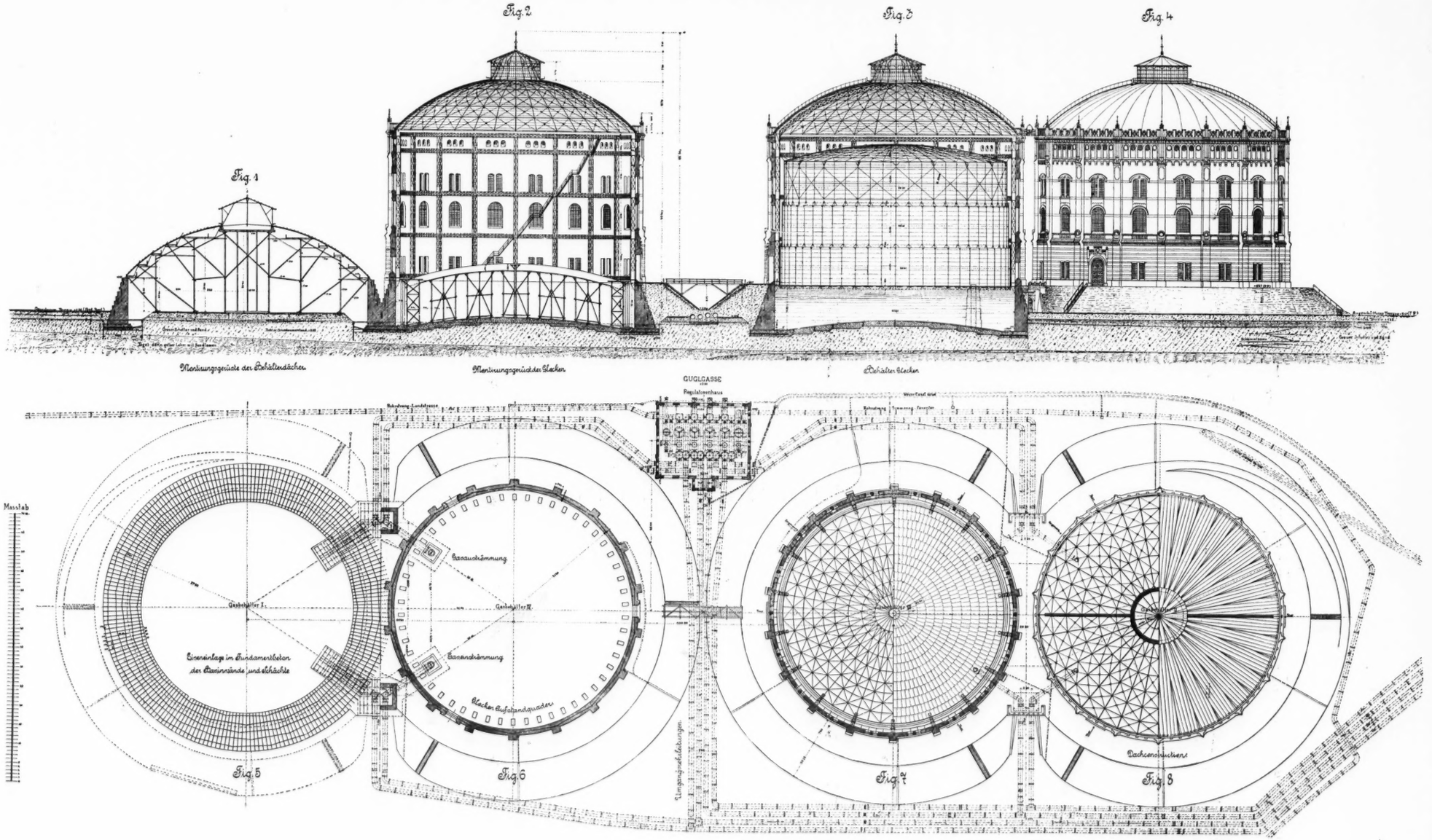


Fig. 15
Horizontalschnitt durch den Blechermantel.

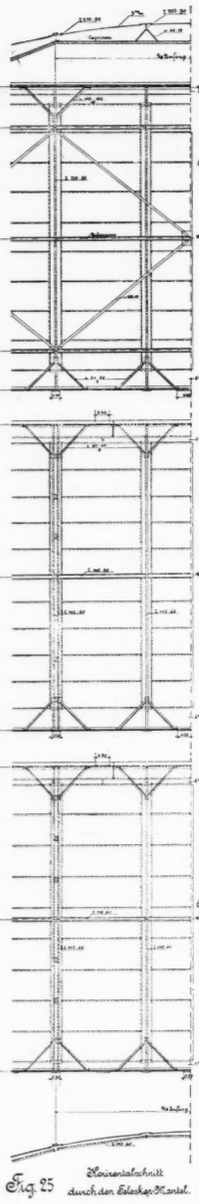
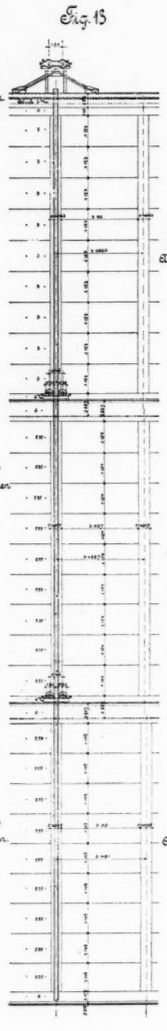


Fig. 16
Querschnitt der Blechermantels.

Fig. 17
Blechermantel.
Ansicht von Innen.

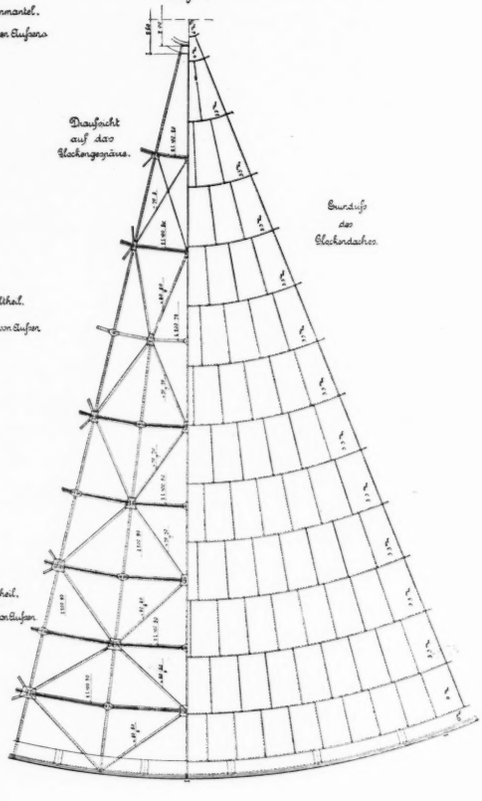
Fig. 18



Blechermantel.
Ansicht von Aussen.

Fig. 19
Schema der Behälter-Bleche.

Fig. 20



Draufsicht auf das Blechgespänne.

Grundriss des Blechdaches.

Fig. 21
Mittelthail.
Ansicht von Innen.

Mittelthail.
Ansicht von Aussen.

Fig. 22
Querschnitt durch den Blechen-mittelthail.

Fig. 23
Querschnitt durch den Blechen unterthail.

Fig. 24
Unterthail.
Ansicht von Innen.

Unterthail.
Ansicht von Aussen.

Fig. 25 Horizontalschnitt durch den Blechen-Mantel.

Fig. 26
Querschnitt durch das Blechendach.

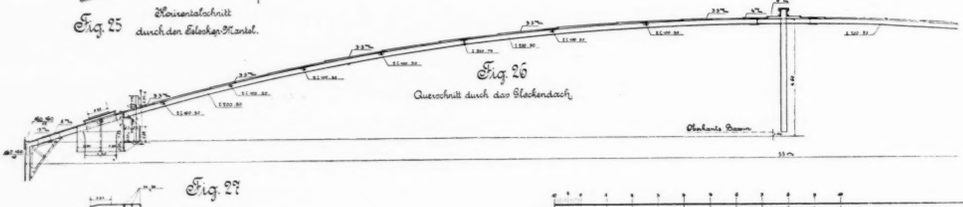


Fig. 27
Grundriss des Mantelbleches im Blechensache

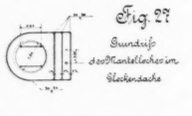
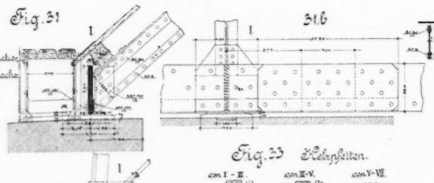


Fig. 31
Einmauerungsanker zur Befestigung der Dachbehälterdecke



31b

Fig. 31a
Schraubenmutter zur Befestigung der Dachsparren

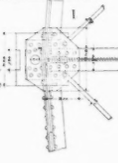
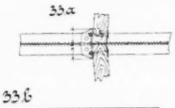
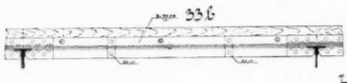


Fig. 33 Kehlpfetten.

33a



33b



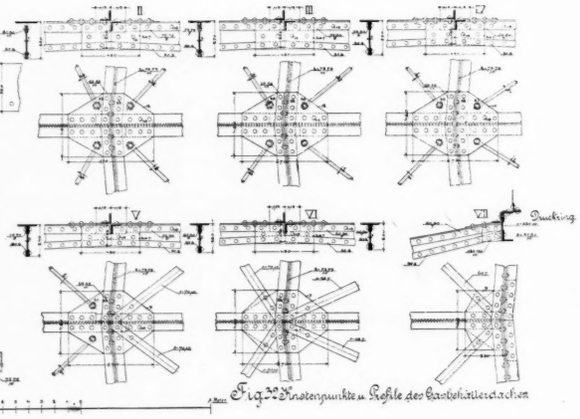


Fig. 32 Knotenpunkte u. Profile des Gasbehälterdaches.

Fig. 28
Externe des Gasbehälter Gebäudes

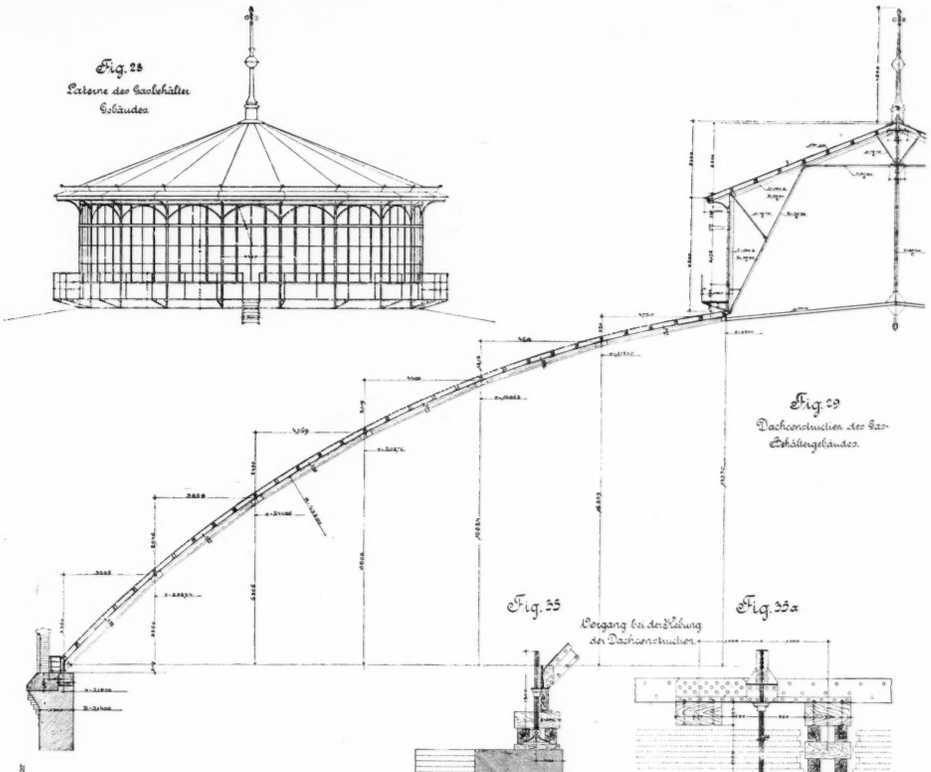


Fig. 29
Dachconstruction des Gas-Behältergebäudes.

Fig. 35
Vorgang bei der Hebung der Dachconstruction

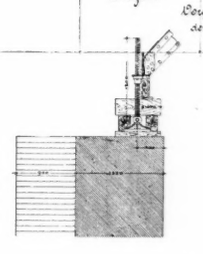
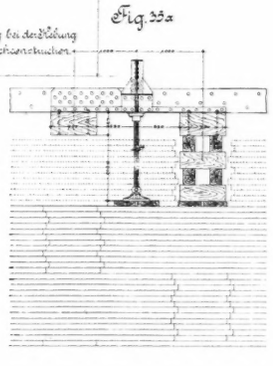


Fig. 35a



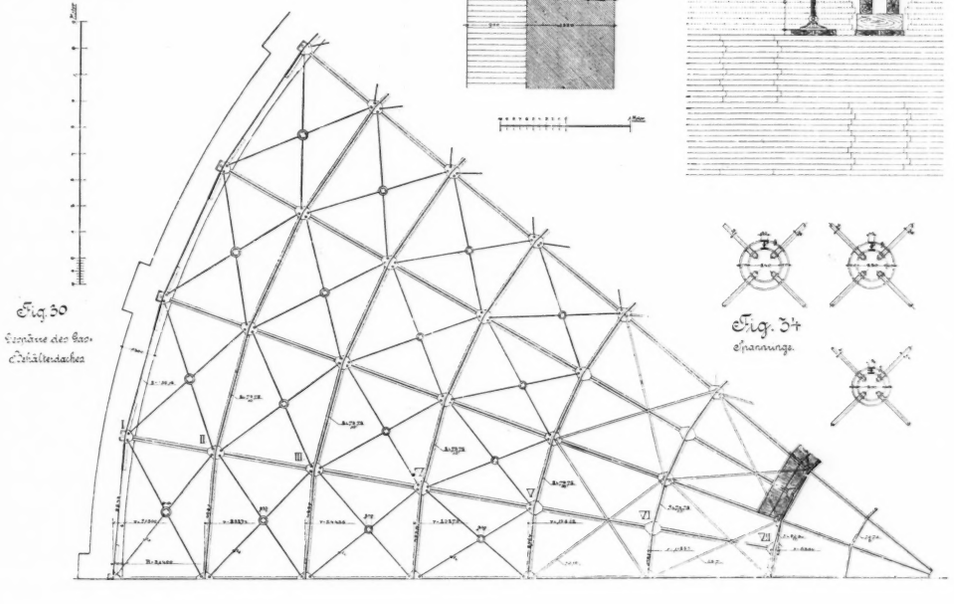
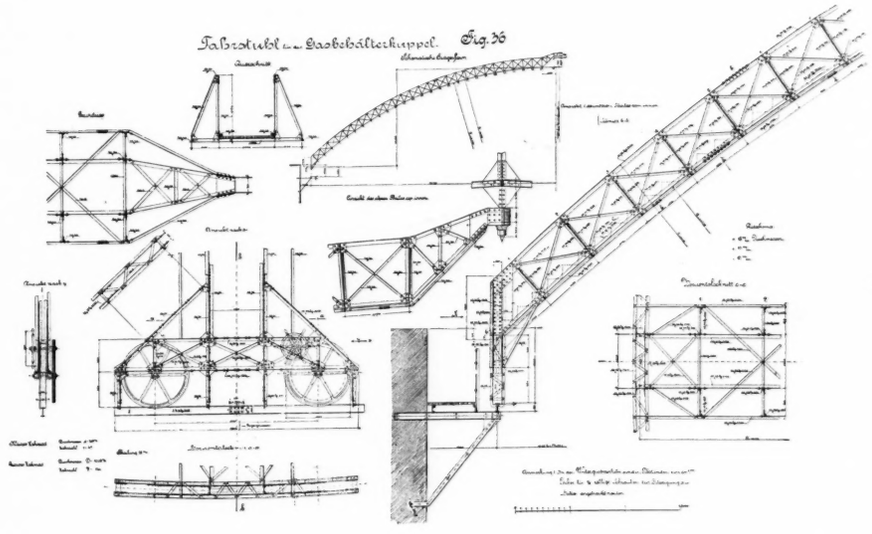


Fig. 30
Externe des Gas-Behälterdaches

Fig. 34
Spannungs.

Fabrikbild v. Gasbehälterkuppel. Fig. 26



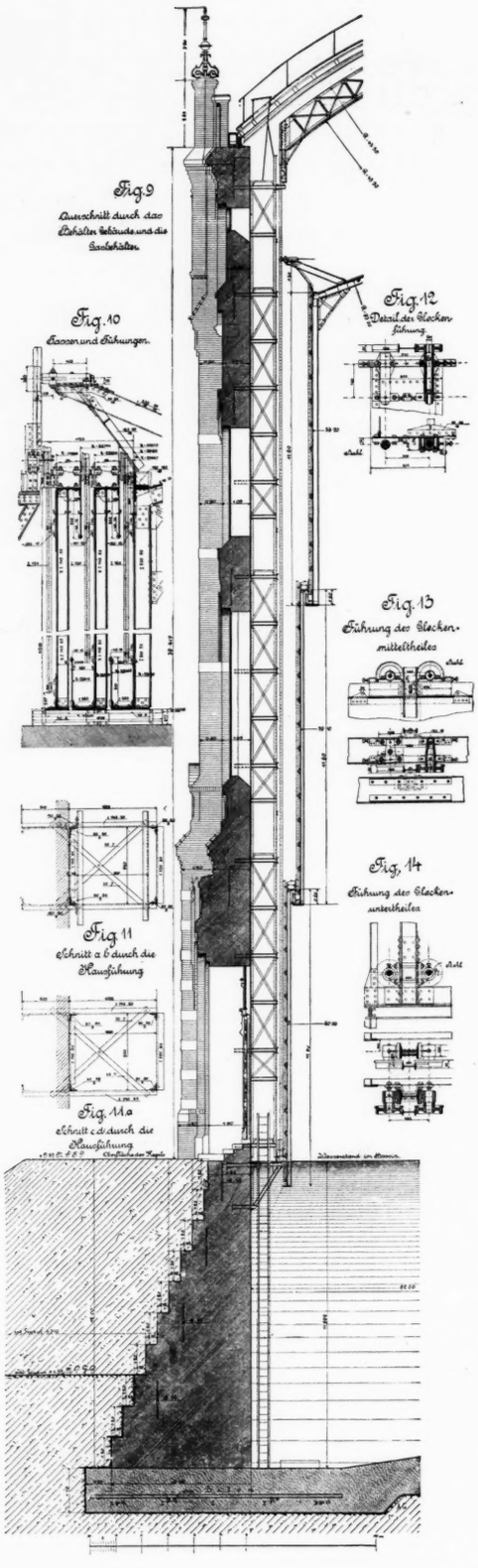


Fig. 9
Querschnitt durch das Kohlen Gebäude und die Seilschächte.
Fig. 10
Caissons und Führungen.
Fig. 11
Schnitt a b durch die Hausführung
Fig. 11a
Schnitt c d durch die Hausführung
Fig. 12
Detail der Glocken führung
Fig. 13
Führung des Glocken-mittelstückes
Fig. 14
Führung des Glocken-unterstückes

stoves, Welsbach burners, &c., and within a year the output was doubled. Perhaps the cost of gas in the holders was not quite as low as before; but the owners were making more money. While recognizing the great need for minimum cost of gas, he wished to emphasize his conviction that increased consumption was decidedly more important. The engineering department of the gas business was up to date; but there was some need for improvement in the commercial department, by the introduction of keen, aggressive business methods. Existing conditions called for low prices, which could only be secured by selling more gas; and he proposed to confine himself to the increased use of fuel gas as secured by the efforts of the commercial department. They were all acquainted with enterprising, pushing, mercantile establishments, everlastingly advertising, largely patronized, well spoken of, making money, and extending operations all the time; and it was only necessary to study the secret of such successes and to apply the methods, as far as possible, to our own business. Many owners of gas property refused to invest the funds required for modern improvements and extensions, and complained that they did not share in the benefits secured by others who had done so. Others having modern and efficient works, failed to extend the mains and services, forgetting that the larger the consumption the cheaper the gas. There was room for educating people as to the value of gas as a fuel; and this could be done verbally, by advertisements in newspapers, and special printed matter, such as pamphlets, &c. But he wished to emphasize the fact that, whatever the method employed, it must be everlasting, not spasmodic. There should be suitable, central, and attractive quarters for the exhibition of gas appliances. A bare unadorned room detracted from the goods exhibited, which should include gas appliances for all kinds of domestic and mechanical purposes, and especially a sample gas-engine. Appliances should be contracted for in good time, and stocks well kept up. One of the most serious drawbacks to the use of gas as a fuel was the ignorance of the masses as to its use; it was not so much the price as the nature of the service furnished that told for or against the sale of gas. When once a number of householders employed gas as a fuel, its adoption would increase at compound interest. All appliances in use should be inspected periodically by officials selected as intelligent, having a knowledge of gas appliances, and ability to impart their knowledge. The manager or salesman need not humiliate himself; but, while active and pushing, he could also be considerate, firm, and dignified. He should be thoroughly competent; not given to jump at conclusions half cocked; a regular reader of current technical literature; an attendant at the Association meetings; and his word should be as good as his bond. He should be cool, courteous, and indulgent—remembering that complaints frequently arise from ignorance rather than malice. With proper efforts, the use of gas-heating stoves could be largely extended. An efficient and really successful manager or salesman must work faithfully and ceaselessly all the six working days.

Discussion being invited, Mr. Clabaugh regretted that the use of gas as an illuminant was treated so slightly, as, in the efforts to push gas as a fuel, they need not overlook its utility as an illuminant. Arc lamps could frequently be replaced with incandescent gas. The use of gas should be urged all along the line. With regard to the hot-water difficulty, all the hot water required in winter could be furnished by the coal-furnace, by a very simple and inexpensive arrangement. The entire cost was £2 10s.; and by this means he was able to secure 90 per cent. of the stoves put out as regular all-the-year-round customers. A company ought to have as many canvassers as they had customers; for correct and courteous treatment would make every customer a canvasser. It was an erroneous impression that the loss of one customer did not matter provided another was obtained in his place. It was hard work to recover a customer lost through mismanagement or dissatisfaction. It was good policy to do many things for nothing; but this could be carried too far, and they might be asked why they did not benefit the majority by reducing the price of gas, instead of giving away things to a minority. Mr. Spragle found that the connection mentioned by the previous speaker could not be applied to some makes of furnace. Heating-stoves should not only be efficient, but attractive in appearance. They were frequently bought for the twofold purpose of utility and ornamentation. Mr. Egner agreed that there was a great deal of injudicious economy in the management of gas companies. Some would not put in meters or services free; and yet it could be shown that capital so invested would earn good returns. Mr. W. S. Allen thought that if builders would only provide some means for warming kitchens, a large increase in the consumption of gas for cooking would follow. He instanced the work done in England by extending the use of the slot meter. In the States, he said they wanted slot meters to take coins of lower value than a 25 cent. piece. Mr. Walton Forstall remarked that in some American cities the gas company would not be allowed to charge more for gas passed through a slot meter. Mr. Rice said that at Norfolk, Va., in a comparitively mild climate, a considerable business was done in church heating, and gas-radiators had been introduced into almost every new church, or whenever changes were made in the heating outfit. It had been found that the churches could be heated more economically with gas than with coal. In Portsmouth, Va., every church was heated by gas; and the result was that the output on Sunday was little less than that on other days. In every line of main, there were several houses unpiped; and it was an important matter to get these houses piped and the occupants using gas. It was a business worth looking after. Mr. Robinson said there was no reason why a circulating hot-water pipe could not be attached to a furnace in such a way as to give an abundant supply of hot water with no further expense for fuel. Mr. Searle thought that in every case fresh business could be obtained if tried for; and it was no use unless one had the right kind of canvassers. The facilities for business at the average gas-office might be improved. People did not care to talk to a clerk through a little hole in the wall, but would often lean over a counter and explain their difficulties or requirements. Sometimes the manners of clerks and employees not only kept away business, but made enemies for the gas company. The canvasser was an important part of the business; and where he was capable of tactfully approaching prospective customers, success was assured. The canvasser should be thoroughly qualified and reliable. Mr. F. B. Persons employed different kinds of canvassers; but they were all required to tell the truth, and avoid misstatements. If they guaranteed a stove or appliance, the Company stood by it. Mr. Ganser agreed that a canvasser who knew the way to go to work was a great acquisition. They must not stop at placing the stove, but follow up and see that its use was properly understood. Mr. A. S. Miller said that the larger part of the gas business was in lighting, and would continue to be so, if as much energy and time were bestowed on it as was put into the fuel end of the trading. Gas managers talked about, and worked for, fuel gas, while there was good lighting business to be had. Large users of electric light could be induced to become consumers of gas. The electricians admitted that the incandescent gas-light had made serious inroads into their business; and it would make more if pushed as it should be. Mr. Harper said that his entire district had been canvassed, and information in regard to every house collected on cards, showing whether piped for gas, if so, purpose for which gas was used, number of rooms, owner, &c. So that in future canvassers could tell in advance, before applying at any house, the probable requirements and chance of success.

Mr. F. D. Moses presented a report from the Committee on National Advertising. In order to carry out a scheme of this sort, a fund would have to be created, which might be done by means of small assessments on the gas companies. The population supplied with gas in the States was about 32 millions; and if every gas company would subscribe 6s. 3d. per 1000 of population in its district per annum, a sum of nearly £10,000 per annum would be raised. It would be expended in magazine and poster advertisements, and for the maintenance of an office for the distribution of advertising matter. Monthly magazine advertisements had been used to much advantage to popularize different commodities; and for about £400 per month, they could get a quarter-page advertisement in all the leading magazines. With a fair proportion of gas companies subscribing, they could place the word "gas" before the public as often as they now see certain soaps, pills, and biscuits; and the cost would hardly be noticeable. For instance, a town of 40,000 inhabitants would only pay £1 per month. The office would form a kind of advertising clearing house, where all matter desired could be collected and sent out in pamphlet form free to subscribers, or sold at a profit to new subscribers. The Committee asked to be authorized to work with the other Gas Associations, and collect subscriptions. Captain White moved that the report be adopted, and the request of the Committee acceded to; and it was seconded by Mr. Littlehales. Mr. Shelton asked for further information, as he understood that no joint action between the Associations had yet been agreed on, nor was it said who would be responsible for determining the advertisements. The report centred most on magazine advertising, which would benefit all alike, whether subscribers or otherwise. Would the Committee take special action, by posters and other local advertising, in the districts occupied by subscribers? He did not think the Association should yet go on record as supporting the plan; and he suggested that at present the Committee should simply report progress. Mr. Persons said the Committee proposed to send to every gas company in the States before Nov. 1 full particulars of the scheme. On Jan. 1 they would ask subscriptions to the fund; and if a satisfactory response was received, they would commence operations on March 1. Subscribers to the fund would have the advantage of being able to obtain cuts or any kind of matter for local advertising. Mr. Moses said that it had been difficult to get the views of the Committees for the different Associations into one general report. But they proposed to print posters in quantity, which could be furnished to subscribers at cost, or sold to others at a profit. The motion was adopted.

(To be continued.)

On Sunday, the 24th ult., the scientific jubilee of M. Berthelot, the eminent French Chemist, was celebrated at the Sorbonne, in Paris. There was a large and influential gathering; Professor Ramsay being present as a representative of the Royal Society. M. Moissan delivered an interesting address, in which he gave an elaborate and suggestive survey of the progress of chemistry during the past half century. Addresses had been sent from upwards of a hundred foreign academies or universities. M. Berthelot's speech in acknowledging the addresses was greeted at its close with a storm of applause. The President of the Republic then handed to the distinguished Chemist a medal designed by M. Chaplain for the occasion, representing him sitting at his laboratory table, and bearing the inscription "Pour la Patrie et la Vérité."

FURTHER NOTES ON RETORT-HOUSE PRACTICE.

By E. H. Earnshaw, of Philadelphia.

[A Paper Read at the Twenty-Ninth Annual Meeting of the American Gaslight Association.]

The last quarter of the Nineteenth Century has been a period of rapid development in all branches of industry; but perhaps in no case has time wrought more significant changes than in the art of producing illuminating gas. The commanding importance assumed by the rapid development of water-gas methods and apparatus, for a long time diverted attention from coal-gas affairs; but of late years there has been an awakened interest in improved methods of coal-gas manufacture. The effect has been that, in many instances, the coal-gas manufacturer of to-day finds that, instead of plain settings, he has now to do with regenerative benches and labour-saving machinery. The change frequently means re-education in the art of the superintendent himself, as well as the foreman and employees under him. His workmen must now be selected with a view to their intelligence, as well as their ability to do manual labour.

The company with which I am connected have, in the last three years, installed two retort-houses, containing 540 retorts, in full-depth regenerative settings of nines; and it was found necessary, in changing from the older methods to the new, to make many alterations in our force of employees—training new foremen and workmen, and dropping others who were too old or were otherwise unable to accommodate themselves to the fresh conditions.

Our experience in developing a new force to handle regenerative benches intelligently, has brought the thought to me that, while several excellent papers have been read before this and other Associations, there might yet be something said that would assist the younger members who may be called upon for the first time to operate benches of this description. The paper read before the Association by its present Secretary (Mr. Forstall), in 1895, entitled "Retort-House Design and Practice,"* is a standard article to-day, and covers the subject most admirably; but I hope in this paper to enlarge upon and emphasize some points which it has seemed to me would be of more value when presented in greater detail.

The first thing to be done in commencing a new setting is to thoroughly dry the brickwork. A fire should be started in the grate, keeping the clinkering door open and all other openings tightly closed, excepting the main stack-damper, which should be opened sufficiently to provide a gentle draught through the stack. The fired is stoked through the charging-door, and the coke kept pushed away from the front of the grate, so as to leave a free space at the front to admit enough air over the top of the fire to completely burn all carbonic oxide. This is most important, as any accumulation of unburnt gases in the setting will form an explosive mixture, liable to become accidentally ignited and cause serious damage to the setting.

This slow fire should be kept up until the brickwork is thoroughly dry, which will take from one to three weeks, depending upon whether the setting is entirely new, or whether the arch has simply been refilled. At the end of this time, the stack-damper should be opened wider, and the fire forced to a white heat, still carefully regarding the precaution that enough air must be admitted above the fire to burn all carbonic oxide completely below the furnace-arch. A small stream of water is supplied to the ash-pan from the very start, in order to prevent the pan from getting hot and cracking when water is finally put in it. As soon as the brickwork in the combustion chamber shows a bright red heat, all danger of an explosion has passed.

The primary and secondary air-slides are now opened, the clinker-door closed, and the furnace filled with coke. If hot coke is available, the furnace may be entirely filled at once; but with cold coke, put in a little at a time, to avoid cooling the fire too much. Blue flames will now be observed issuing from the nostrils or openings in the arch between the generator and the combustion chamber, and the setting is ready to receive the adjustment of dampers and slides necessary to bring the heats up slowly and uniformly.

If we now pause to consider the theoretical conditions existing in a regenerative setting, we shall find it easier to formulate the proper method of making this adjustment. In a regenerative setting, the furnace or generator is simply a gas-producer, usually located under the setting for convenience, and also to enable the heat of primary combustion to be fully utilized. The air entering through the primary air openings is heated by contact with the walls of the waste-gas flues, and enters the generator through the primary air ports under the grate, and, together with steam, flows up through the hot body of coke. The resulting producer gas passes through the openings in the furnace-arch into the combustion chamber, and is there met by the secondary air, which, entering at the secondary air openings, has travelled through the recuperative flues in close contact with the waste-gas flues, carrying the highly-heated products of combustion to the chimney-stack. The secondary air thus absorbs heat from the waste gases, which would otherwise be carried away and lost, and returns it to the setting. The highly-heated secondary air provides the oxygen necessary to burn the producer gas; and the flame thus produced in the combustion chamber is very intense. Just enough secondary air is admitted to completely consume the quantity of producer gas formed in the generator, as any excess of air will lower the temperature of the flame and also carry away from the setting to the stack the heat necessary to raise the excessive amount of air to the temperature of the waste gases.

The greater the pull exerted by the chimney, the greater will be the tendency to draw the products of combustion directly from the combustion chamber, over the lower-side retort, and into the waste-gas flues. The smaller the pull on the setting, the greater will be the opportunity for the heated gases to reach all parts of the setting, and give a regular and uniform distribution of the heat. Moreover, an excessive pull from the stack has a tendency to cause a blow-pipe effect in the combustion chamber, concentrating heat at that point, and resulting in the destruction of the brickwork.

It will be readily seen, therefore, that the bench should be run with the stack-damper opened only wide enough to permit the products of combustion to escape, without causing an actual back-pressure on the setting. With dampers and slides adjusted in any position, the amount of secondary air drawn in is practically a constant quality; but for a given opening of the primary slides, the amount of carbonic oxide produced will vary with the condition of the fire. Consequently, the most important point in maintaining regular and uniform heats is the care of the fire; and every effort should be made to keep the body of coke of uniform depth, and the clinkering and shaking up of the fire should be so regulated that the resistance to the free passage of air through the fire should be as nearly as possible the same at all times.

Returning now to the adjusting of dampers and slides to raise the heats, it is evident that, as but little producer gas will be required at first, the primary slides should only be opened a little. The secondary air slides are adjusted so as to provide only just sufficient air to consume the producer gas, and the stack-damper set so that there is no decided pull on the setting. The chief precaution to be observed at this time is to bring the heats up slowly and evenly. The subsequent life of the setting will in a great measure depend upon careful handling at this period. The brickwork necessarily expands with the increasing heat, and time is required to allow this expansion to take place without cracking or otherwise injuring the setting. The proper adjustment of the secondary air is obtained by noting in the waste-gas flues above the stack-damper the disappearance of the blue flame indicating the presence of carbonic oxide. Assuming that the air-slides are 7 inches high, which is a common size, the primary slides are set at a ¼ inch opening. The secondary air slides are closed until a blue flame can be seen in the waste-gas flues, and are then gradually opened again until the flame just disappears—waiting a few minutes after each change before noting the effect. The stack-damper adjustment is not of great importance at this period; but the pull on the setting should not be too great. As the heats come up, the primary air slides should be opened gradually, ¼ inch at a time, and the secondary slides adjusted to correspond. The stack-damper will probably have to be opened wider from time to time, to permit the escape of the increased amount of combustion products.

As soon as the retorts are hot enough to burn off a light charge, the regular charging of the coal should be begun, and the raising of the heats continued; so that at least a week will elapse from the time that the retorts are first charged until the full working heat of the bench is obtained. When the bench has reached a good working heat, the stack-damper should be adjusted so that there is no decided pull or pressure on the combustion chamber. The method of obtaining this condition is well described by Mr. Forstall: "The chimney dampers are pushed in until, on opening the charging-door of the furnace, and throwing in a handful of coal dust, the resulting flame plays lazily back and forth out of the door; neither being drawn steadily in by the draught, nor burning up too vigorously from excess of pressure."

As long as the benches are run at a moderate temperature, the waste-gas flues should not show anything above a dull red at the point of entrance of the secondary air; and under these conditions it is easy to notice the presence or absence of unconsumed carbonic oxide. If the benches are pushed to such a temperature that the make per mouthpiece reaches 11,000 cubic feet per day or over, the temperature of the waste-gas flues will considerably increase; and it then becomes a matter of great difficulty to distinguish whether any flame is present. In regulating the secondary air to these conditions, the temperature of the waste-gas flues and the general condition of the setting must be taken into consideration. A smoky appearance in the flues indicates too little secondary air, and a very clear heat indicates too much. The waste-gas flues should show the same heat on each side; and this heat should not be higher than a dark red in the bottom flue nearest the stack.

It will frequently be found that one side of the bench heats better than the other; and on observing the waste-gas flues, it will be seen that one side is also hotter than the other. To overcome this condition, it will be necessary to push in the stack-damper and increase the secondary opening on the hot side, and correspondingly increase the damper opening and decrease the secondary opening on the cold side. This will cause the hot gases to travel to the cold side, and the flues will gradually heat up. As they become hotter, the damper and slides should be

* See "Journal," Vol. LXVI., p. 1031.

TABLE I.—*Analyses of Producer Gas and Waste Gases from Regenerative Setting.*

	Series No. 1.					Series No. 2.					Series No. 3.				
—	CO.	CO_2.	O_2.	H_2.	N_2.	CO.	CO_2.	O_2.	H_2.	N_2.	CO.	CO_2.	O_2.	H_2.	N_2.
Producer gas	26·4	7·0	0·2	12·2	54·2	27·9	5·8	0·2	14·9	51·4	25·8	7·3	0·4	12·1	54·6
Waste gas	2·1	18·4	0·6	..	79·9	1·3	18·9	0·4	..	78·4	1·8	17·9	0·5	..	79·8
Samples taken 6 hours after clinkering fire.															
Producer gas	21·8	7·1	0·3	11·7	59·1	22·2	7·3	0·3	3·7	66·5	29·9	3·6	0·3	6·6	60·1
Waste gas	..	19·7	0·5	..	78·8	..	18·7	1·7	..	79·6	..	18·9	1·2	..	79·9
Samples taken 12 hours after clinkering fire.															
Producer gas	24·6	8·0	0·3	14·4	52·7	22·8	9·1	0·3	17·4	50·4	26·9	8·0	0·3	17·3	47·5
Waste gas	..	19·7	0·5	..	78·8	..	19·5	0·6	..	79·9	..	18·9	0·5	..	80·6
Samples taken 18 hours after clinkering fire.															
Producer gas	29·9	5·9	0·2	14·3	49·7	26·8	7·9	0·3	14·1	51·1	28·7	5·5	0·3	15·0	50·7
Waste gas	..	16·0	4·0	..	80·0	..	14·0	6·3	..	79·7	..	14·2	5·9	..	80·1
Samples taken 24 hours after clinkering fire.															

Notes to Table No. I.—Producer-gas samples taken under furnace arch; waste-gas samples taken in waste-gas flues, above stack-damper; all samples were taken two hours after charging furnace with coke and one hour after shaking up fire.

Adjustment of Dampers.—Stack-damper opening, 5¼ inches by 15 inches; primary air opening, 2½ inches by 7 inches; secondary air opening, 2¾ inches by 7 inches.

gradually restored to their former condition. The principle of this adjustment is that the stack has become more highly heated on the hot side than on the cold, with a consequently stronger draught; and it is necessary, therefore, at first to produce abnormal conditions to force the gases to travel through the stack having the lesser amount of draught. As the cold chimney-stack becomes hotter, the draught increases and therefore the dampers should be gradually changed until they are equally opened again.

The final adjustment of the dampers and slides to secure the most economical operation of the bench, is a matter for careful experiment; bearing in mind that the primary air slides must be opened sufficiently to secure the production of the necessary carbonic oxide, and the stack-damper must be adjusted to the smallest opening consistent with maintaining the required heat in the setting. The sensitiveness of a full-depth regenerative setting is very great. The balance of the bench is easily disturbed; and changes in regulating dampers and slides should be made with great caution, and only after due consideration. In this connection, it is of great assistance to keep a full record of all the changes made on the bench, giving the reasons for making the change and the apparent effect. It should also be remembered that the full effect of any change will scarcely be obtained in less than 24 hours. If a bench is not heating properly, a diagnosis of the trouble should be made somewhat as follows.

The first thing to be determined is whether the furnace is consuming the normal amount of coke. This is most important, and is the keynote to the whole situation; but it is often disregarded. An accurate record should be kept at all times of the amount of coke charged into the furnace, so that a deficiency or an excess of coke will be promptly noticed. If the furnace is found not to be burning the normal amount of coke, the condition of the fire should be examined at once; and, if necessary, the fire clinkered, whether it is schedule time for such a thing or not. The nostrils or openings in the furnace-arch should also be carefully examined, to make sure that they have not become partly obstructed. If this does not remove the trouble, increase the primary openings until the consumption of coke becomes normal, at the same time regulating the secondary air to correspond to the increased amount of the producer gas. Examine the waste-gas flues, and see that they are normally heated and free from dirt. The waste-gas flues should be regularly cleaned about once in six weeks or two months, as an accumulation of dirt in them prevents the heat from being properly communicated to the secondary air. On the other hand, if the amount of coke consumed is found to be excessive, one of several conditions may be responsible for the poor results. There may be too much draught on the setting, which would be indicated by overheated waste flues, a sharp heat in the combustion chamber, but upper retorts poorly heated. A marked excess or deficiency of secondary air would each result in poor heating of the bench; but the presence or absence of flame, or a smoky appearance in the waste-gas flues, would quickly indicate in which direction the trouble lay. When the dampers and slides have once been satisfactorily adjusted, it will very seldom become necessary to make any alterations in them, except to control the distribution of heat in the bench as already described.

It sometimes happens—especially as the bench gets old—that pieces of tile will fall into the nostrils, and obstruct them to such an extent that the normal operation of the bench is interfered with It is frequently very difficult to entirely remove these obstructions without shutting down; and in some cases the efficiency of the bench will be seriously affected. An instance of clogged nostrils occurred in one of our benches, and the resulting condition of the setting was interesting and instructive. The bench was not heating well, and the consumption of coke was low. Opening the primary slides to their fullest extent did not materially increase the production of producer gas; and it was necessary to increase the stack-damper opening. This had the effect of increasing the coke consumption; but the flues became overheated, and the bench still did not heat properly. The choked nostrils offered a resistance to the free passage of the producer gas from the generator to the combustion chamber, and diminished the effective draught through the fire to such an extent that the formation of the necessary amount of producer gas was prevented. Increasing the damper opening caused such a pull in the combustion chamber that the effect of the choked nostrils was overcome; but the products of combustion were drawn too quickly to the stack, resulting in overheated waste-gas flues and irregular heats in the retorts. Evidently some means must be devised to get sufficient producer gas into the combustion chamber without disturbing the normal condition of affairs above the furnace-arch. It was decided to put a small steam-jet blower in the primary flue, in order to produce a forced draught under the grate, and enable us to reduce the stack-damper opening and restore normal conditions above the furnace arch. As soon as this was done, matters improved; and we were able to get a satisfactory heat in the setting with a normal consumption of coke.

As a practical instance of the proper adjustment, benches are run with the stack-damper open from 5 inches to 5½ inches; the damper being 15 inches wide. The primary air slides, which are 7 inches high, are opened 2 inches; and the secondary air slides, also 7 inches high, are opened 2½ inches. With this adjustment, there is attained a high and uniform heat, with an average make per mouthpiece of about 11,500 cubic feet per day, and an economical consumption of coke in the furnace. The actual consumption of coke is a difficult matter to determine with accuracy.

When the fuel used in the generators is coke from the West Virginia coal, it has been found necessary to clinker the fires as often as once in 24 hours. To trace the effect of the deterioration of the fire on the production of producer gas, and also to see how nearly uniform conditions were maintained in the setting, arrangements were made to analyze samples of producer gas and waste gas at regular intervals throughout the 24 hours. A number of analyses were made, of which three series, taken on different days from the same bench, are shown in Table I. In this particular instance, it will be noted that the supply of secondary air was slightly deficient at the end of the first 6 hours after clinkering, but was considerably in excess at the end of the 24 hours. The reduction in quantity of producer gas is very marked during the last 6 hours; and it is quite clear that the cleaning of the fire could not be postponed. To investigate still further the conditions existing in the setting, pressures were taken at different points with a King's Arch gauge, reading to 1-100 inch. The pressure conditions were found uniform on the benches; and the results tabulated in Table II. are representative of all.

TABLE II.—*Pressures at Different Points in Full-Depth Regenerative Setting.*

—	Bench No. 15.	Bench No. 17.	Bench No. 18.
Chimney flue, below stack-damper	—0·19	—0·18 in.	—0 22
Waste-gas flue, above	—0·10	—0·10	—0 10
Entrance to recuperative flues	0·00	0 00	0·00
Combustion chamber	0·00	0·00	0 00
Below furnace-arch	0·00	0·00	0 00
Under grate	—0·01	—0 02	—0·01
Entrance to primary air flue	—0 03	—0 03	—0·03
,, secondary ,,	—0·06	—0·07	—0·05
Adjustment for slides, &c.:—			
Stack-damper opening	5¼in. by 15in.	5¼in. by 15in.	5¼in. by 15in.
Primary air ,,	2 in. by 7in.	2 in. by 7in.	2½in. by 7in.
Secondary air ,,	2½in. by 7in.	2½in. by 7in.	2¾in. by 7in.
Maximum vacuums:—			
Chimney flue, damper closed	—0 26	—0·25	—0·27
Primary flue, primary slide closed	—0·07	—0 09	—0·06
Secondary flue, secondary slide closed	—0·09	—0 09	—0·08

As has been said, the care of the fire is most important. The fires should be clinkered often enough to keep them in good condition. No definite rule can be given for this, as the character of the fuel, amount of ash it contains, hardness of clinker formed, &c., will be found to be the controlling factors. With the coke from Pennsylvania coal, we have found it best to clinker every 48 hours. About once in four hours the fire is shaken up thoroughly with a slicing bar, running it up along the side walls to cut off any loose clinker, which, if allowed to remain, is likely to harden and become difficult to remove. With coke from West Virginia coal, the character of the ash makes it necessary to clinker the fires every 24 hours; and the fires are also shaken up every two hours instead of every four. Every effort should be made to keep the fires in uniform condition, and to prevent the coke from getting low in the furnace. About 15 minutes before feeding the fire with coke, the charging-door should be opened and the coke pushed well to the back of the furnace. This is of material assistance in maintaining a uniform bed of coke. The door covering the charging-hole should be carefully watched, to see that it fits tight, and that no air is drawn in at that point to cause secondary combustion under the furnace-arch. Whenever the door gets red hot, it is an indication that the coke is too low in the furnace, or that secondary combustion is taking place below the furnace-arch.

It is difficult to explain how to clinker a fire, as it is an art that must be learned in actual practice. It should be done quickly and thoroughly. The general method is to drive secondary bars through the fire above the clinker-line, in order to support the coke while the clinker and ashes are being removed. Enough of the regular grate-bars are taken out to allow the clinker and ash to fall into the ashpit; the hard clinker is cut away with chisel-bars; and as soon as the fire is cleaned, the regular grate-bars are put back in place, the temporary bars withdrawn, and the coke allowed to fall upon the grate. Care should be taken that there is a sufficient body of coke in the fire to prevent cold air from being drawn into the setting. It is the usual custom to use flat bars 3 in. by $\frac{3}{4}$ in. for the temporary bars; but where the fire is difficult to clinker, we have found that these bars become hot, and will not hold the fire up long enough. We therefore use square bars of $1\frac{1}{4}$-inch iron, and have found them much more satisfactory. We have not found it good practice to admit steam under the grate, for the reason that the quantity admitted cannot be controlled with sufficient accuracy; and the result is likely to be irregular production of producer gas, and, of course, irregular heating of the bench. The steam necessary to keep the grate-bars cool and to soften the clinker is provided in a regular amount by the evaporation of the water in the ashpan.

Coming now to the work on the charging-floor, the one thing which makes most for smooth running is the proper care of the stand-pipes. No matter how well everything else may be run, stopped stand-pipes mean poor results and worn out, discouraged men. We have found that the only way to avoid stopped stand-pipes is to keep them perfectly clean. In other words, if the pipes are thoroughly cleaned every time that a charge is put into the retorts, they will not stop up before the charge is burnt off. This is not a hard thing to accomplish, if every man does his duty and the work is not neglected. When once the pipes begin to stop badly, it usually happens that special attention is given to the worst ones, and those which are apparently clean are neglected, with the inevitable result that all the pipes are more or less stopped up, and the work of the house gets thoroughly demoralized. When a condition of this kind arises, the only remedy is to attack the situation vigorously, burn out the pipes to the iron, and when once clean see that they are kept so. The design and character of tools used for the cleaning of stand-pipes vary considerably in different works, and seem to be controlled by local practice. The main point is that the pipes must always be kept clean; the tools used are of secondary importance. Arranging the work so as to enable the foreman to fix responsibility for neglected pipes, is a matter of the first importance. The work is sure to be neglected unless this is done; and the method we have adopted is as follows.

With machine charging and discharging, our working force is reduced to one man to each two benches of nines. The men work in pairs, giving four benches two men; and each man is responsible for the condition of his particular two benches. In addition to the care of the stand-pipes and bridge-pipes, each man sweeps up in front of his two benches after each charge, pushes the coke back in the furnace, cleans the lids, and in general sees that everything is kept in good shape. This plan works well, and encourages the men to feel a pride in the condition and appearance of their special charge; and they have all learnt by this time that careful attention to the condition of their benches really saves them work.

About 15 minutes before the time for drawing the charge, the lids are opened, and the stand-pipes cleaned. Once in every 24 hours the bridge-cap is opened, and the bridge-pipe thoroughly cleaned.

Our men work in three shifts of eight hours each, so that the care of the 18 bridge-pipes belonging to two benches is divided among the three men who succeed each other in charge of these two benches during the 24 hours; each man having his particular six bridge-pipes to clean. This thorough cleaning of the bridge and stand pipes is done at the beginning of every shift, and is the first and most important duty of each man. This system, carefully carried out, will certainly result in entire freedom from stopped stand-pipes. Even though running with high heats, and using a class of coal which makes a very pitchy tar, stopped stand pipes have become with us a thing of the past. While clean stand-pipes make smooth running, good carbonization results depend upon the way the coal is put into the retorts, the size of the charge in relation to the size of the retort, and the even distribution of the heat throughout the setting. The charge must be put in as nearly level as possible, neither banked up in front nor at the back; and the heats must be so evenly distributed that the charge will be burnt off in all parts as nearly as possible at the same time.

In coal-gas works, there is no such thing as averaging results. Having one-half of a charge too much burnt off and the other half too little, will not make an average of one charge well burnt off. In the same way, all the retorts in each bench throughout the house must be evenly heated, as a hot bench will not in any way average up the results with a cold bench. Each retort, and every part of each retort, must be properly heated, and each charge evenly put in to secure the best results. The charge of coal naturally burns off first on the outside, leaving the core not yet thoroughly carbonized. We have found it of material advantage to break the charge with a long slicing bar about an hour before the time for drawing it. We were led to do this because we have often noticed that, when a lid is opened, a charge may appear to be thoroughly burned off; but as soon as it is stirred up by the drawing-rakes, a very considerable amount of gas comes off. The gas lost when the retorts are opened for this purpose is much more than compensated for by the better burning off of the charge. As a matter of fact, if this method of breaking up the charge is adopted, the time for cleaning the stand-pipes can with advantage be moved back an hour, so that the stand-pipes can be cleaned, and the charge broken up with the one opening of the lid. In this case, the pipes are first cleaned, and then the slicing-bar is used to loosen up the charge, and the lid closed. At the time for drawing and charging the retorts an hour later, nothing has to be done to the stand-pipes, and the work of charging the retorts proceeds rapidly and without interruption or delay.

Putting in a level charge of coal is easily managed, if the work is done with a properly-constructed machine; but failing this, we have found scoop charging to be much superior to hand charging. Even with scoop charging, however, it is difficult to get the coal placed in sufficient quantity at the back of the retort. The even distribution of heat throughout the setting can, to an extent, be controlled by charging most coal where the retort is hottest, which will usually be at the back. It is better, however, to put the coal in evenly, and obtain even distribution of heat by other means.

The back of the retort being the hottest part of the setting under normal conditions, the heat can be brought forward by reducing the supply of producer gas at that point. To do this, the nostrils are partly or wholly covered with tiles, which are pushed over the nostrils a little at a time, until the adjustment is found by the results to be about right. It is generally necessary to entirely cover the back row of nostrils, and sometimes an additional row under the middle retort. If the side nostrils are big enough, we believe that the overheating of the middle bottom retort can be entirely prevented by sufficiently reducing the size of the nostrils directly under this retort. Unfortunately, the side nostrils in our setting are not big enough to permit us to cover the middle nostrils to the extent required, although we have been able to prove to our own satisfaction that in this way the excessive heat of the bottom middle retort can be overcome.

Proper attention to scurfing the retorts is a matter of importance. The carbon should never be allowed to accumulate to an extent that will interfere with the normal operation of the retorts. A good rule is to scurf so many retorts each day that the entire number will be gone over once a month.

In laying out the work of the charging-floor, we have found it most satisfactory, with 4-hour charges, to draw one-fourth of the retorts each hour. This arrangement equalizes the work on the men and the make of gas, and also divides periods for charging the furnace. An equal number of the furnaces are charged every round, instead of charging them all at the same hour, as is sometimes the practice.

The general efficiency of the work in the retort-house is promoted by having strict rules in regard to cleanliness. Everything about the house should be kept as clean as possible. The lids, the settings themselves, and the floor should be kept clean at all times. Arrangements should be made to provide suitable places for keeping the necessary tools; and they should be kept in their places. The men will do better work, and take more pride in it; and the carbonizing results will be better, if all work is done in a tidy and neat manner.

The proper relation of the cross-section area and the shape of the retort and the size of the charge, is too large and important a subject to be properly discussed in a paper of this character; but it may be of interest to give some account of our experience in determining the proper weight of charge for our fixed conditions. Our settings are standard settings of nines, with retorts 16 in. by 26 in. by 9 ft. long, designed, we are told, to turn out a make of 10,000 cubic feet per retort per day, with a yield of 5 cubic feet per pound of coal carbonized. Our earlier practice was, therefore, to charge an average of about 330 lbs. per retort, burning off the charge in four hours; so that, to obtain the desired 10,000 cubic feet, it was necessary to get as large a yield of gas as possible from the coal. With this method of working, things did not go in a satisfactory manner. We had difficulty in keeping the stand

pipes clean, and were annoyed by an excessive amount of free carbon in the tar. This was of importance to us, not only on account of the inconvenience and expense caused by thick tar in the mains, but because the contractor for the tar seriously complained of its quality. We were at a loss to explain the exact cause of this condition, and were led to undertake a systematic attempt to study the conditions controlling the formation of free carbon; coming to the conclusion that the carbon was formed in the retort by the contact of the gas with the hot sides of the retort. We concluded that, if we could fill the retort as nearly full of coal as possible, we might be able to evercome the difficulty.

Following this idea, we charged a number of benches by hand, putting 500 lbs. of coal in a retort, and burning it off in six hours. We found that, under similar conditions, charging the same amount of coal per retort per 24 hours, the six-hour charges gave very much less carbon in the tar than the four-hour charges. To test this point thoroughly, we arranged to charge the entire stack with 500 lbs. of coal per retort, and six-hour charges. We made this change anticipating greatly improved results, but were surprised to find that, with the single exception of reducing the amount of carbon in the tar, the change was decidedly for the worse. The candle power was lower, and we got less gas per pound of coal. When the retorts were opened, the charge appeared well burnt off; but as soon as the drawing-rake touched the charge, it became evident that the coal in the centre was not thoroughly carbonized. It seemed impossible to increase the heat to a point that would thoroughly carbonize this large charge. The retorts being so full of coal, also gave us a great deal of trouble in drawing the coke; and our drawing machines were constantly breaking down.

In studying the results obtained in coke-oven practice, it appeared that, in spite of the fact that all the gas was eventually driven out of the coal, the yield and candle power were low as compared with retort practice. We then determined to make some laboratory experiments that might throw some light upon the subject. These experiments were designed to show: First, whether the temperature of carbonization had any effect upon the total quantity of volatile matter driven off; and, secondly, how such an effect would be modified by variation in the mass of coal. A weighed sample of coal was placed in a closed crucible and exposed to a low red heat, until no further gas was given off. The crucible was then heated to the highest temperature to be obtained with a blast lamp, cooled, and weighed. The loss in weight represented the volatile matter driven off.

A second example was carbonized at a bright red heat, driving off the last traces of volatile matter with a blast lamp as before. The experiment was continued by successively carbonizing 1 gramme, 3 grammes, and 6 grammes, by each of the methods above described. The results obtained are given below. Each experiment was repeated a sufficient number of times to eliminate experimental errors; and the figures tabulated are the average results.

Quantity of Coal taken.	1 Gr. Per Cent.	3 Grs. Per Cent.	6 Grs. Per Cent.
Volatile matter given off, low red heat . .	36·03	34·71	33·77
,, ,, ,, ,, bright red heat . .	38·86	37·22	36·42

The conclusions reached were: (1) When gas coal is carbonized in a closed retort, and the carbonization is complete, the proportion between the weight of the coal left in the retort and the weight of the volatile matter driven off is greatly affected by the temperature of the retort and the mass of coal carbonized; (2) the percentage of the volatile matter driven off varies directly as the temperature of the retort, and inversely as the mass of coal. The practical application of these conclusions to our work seemed to account in a measure for the poor results, and to point to more rapid carbonization and smaller charges. Consequently, we determined on a radical change by adopting three-hour charges.

We began by charging 250 lbs. of coal every three hours, so as to carbonize 2000 lbs. per retort in 24 hours, as we had been doing. The make of gas and candle power showed an immediate improvement; but in a short time we had blocked the take-off main with lampblack, the stand-pipes stopped faster than we could clean them, and the tar became so thick that it would barely run in a 12-inch pipe. To keep going at all, we were obliged to charge the retorts so heavily that the yield fell very low. It was now apparent that we had not appreciated the effect of a small charge in a large retort, and that the large exposed surface of the highly heated retort was the cause of the excessive amount of lampblack. The fact that there is a minimum allowable proportion between the cross-section areas of retort and charge, was brought home to us in a vigorous and conclusive manner.

The experience was valuable, and enabled us to understand many things that had hitherto been a puzzle. We reasoned thus: Since high heats and quick carbonization are necessary, we must increase the temperature of the retort; and to avoid excessive free carbon, the charge must be as large as possible in proportion to the size of the retort. This brought us directly back to four-hour charges; but instead of pushing for yield and dropping the heats when the tar became too heavy, we temporarily neglected the question of yield, and charged the retorts heavily enough to keep things smooth as the heats of the retorts increased. This plan worked admirably; and we have had no trouble since.

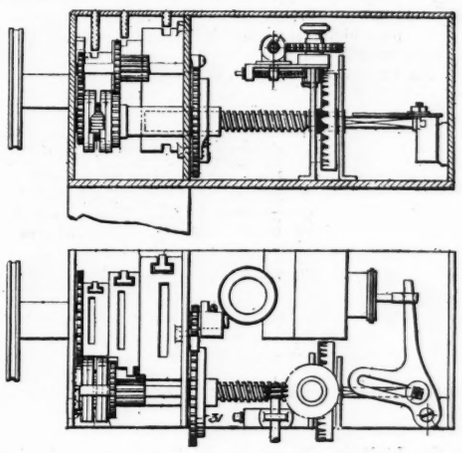
For the past year, we have been turning out steadily over 11,000 cubic feet per retort per day, corrected to 60° Fahr., sometimes as high as 12,000 cubic feet—and without injury to the retorts or settings. We have a stack of 18 benches, which has been steadily under fire for more than two years, and it is still in good condition. Only three bottom middle retorts have been blanked; and two of these were lost the first year. We have no trouble with the tar or with stopped stand-pipes; and the candle power and yield are satisfactory. The heats necessary to be maintained are so high that we have about reached the limit of the temperature to which we dare subject the brickwork of our settings; but we feel convinced that we could obtain better results if we could put the weight of the charge still higher. In other words, the results of our experience, while satisfactory in a measure, only show that, for our fixed conditions, a four-hour charge is better than either a three or five hour charge, and that 400 lbs. of coal can be carbonized in four hours with reasonable efficiency.

REGISTER OF PATENTS.

Coin-Controlled Mechanism for Use with Prepayment Gas-Meters.—Marland, W. W., and Large, E., of Oldham. No. 18,577; Oct. 18, 1900.

This invention is intended to provide means whereby the user can pay several values of coins, and obtain corresponding supplies of gas, without any change of the mechanism.

The patentees employ a metal casing or shell (as shown), preferably similar in form to a stepped pulley; the number of steps corresponding to the various values of coins to be used. In each step slots are formed corresponding to the size of the coins to be employed; the slot in the largest step being (for example) adapted for the reception of a penny, the slot in the next step for a shilling, and the slot in the smallest step for a sixpence. Within the casing (which is a fixture) there is a short spindle or shaft, upon which is mounted a series of bosses, one for each of the steps of the outer casing; and in each boss is a recess corresponding to the width of slots in the casing.



Fitting loosely around each boss, and within the outer casing, is an annular ring or carrier, which is also slotted in keeping with the slots in the outer casing and bosses; and upon (or connected with) each of such rings is a toothed wheel. Adjacent to the casing, there is mounted a tube fitted with further toothed wheels, which gear with the toothed wheels on the rings aforesaid; the casing being cut away at one side to allow of the wheels meshing. The wheels on the tube are free to rotate in one direction without affecting the tube; but when rotated in the opposite direction, each acts through a pawl and ratchet-wheel, and rotates the tube.

The interior of the tube is provided with a screw-thread corresponding in pitch to the thread of a spindle which, at its upper end, operates the valve for controlling the gas supply. A portion of its length is made square, or is provided with a "feather" key, so that it passes loosely through a gear-wheel, identified with the meter-counting mechanism, or with mechanism which will serve to close the valve.

With the parts suitably enclosed (having slots corresponding to those in the casing, and each slot marked according to the value of the coin to be inserted), a handle applied to the end of the spindle which carries the bosses, and an index-plate and set of stops fixed adjacent to such handle, the apparatus is ready for use.

Upon the insertion of a coin in the slot intended to receive it, the coin falls into the recess in the boss, which, being shallower than the diameter of the coin, causes it to lie partly in the recess and partly in the slot of the loose ring around the boss. The handle is then used to impart a half-revolution to the spindle and bosses, also to the ring surrounding the boss in which lies the coin—due to the latter acting for the time as a "key" between the boss and ring. Immediately the ring and boss have completed the half-revolution (which is determined by one of the stops), the coin falls out of the recess into a box placed to receive it, and thus disengages the ring. The handle and boss are then turned back to the starting-point, ready to receive the next coin through the other slot of the ring, which, by the previous turning of the boss, has been brought uppermost. The half-revolution of the boss and ring is imparted by the gear-wheels to the tube aforesaid; and, by rotating, the tube travels the spindle into it, and thus causes the spindle to open the gas supply valve to the desired extent, which varies for each coin with the difference in the speed-values of the gear-wheels. As the gas is consumed, the meter-counting mechanism gradually closes the valve; and when closed, the amount of gas consumed is the amount paid for.

When a change in the price of gas takes place, the speed either of

the ring gear-wheels, or the gear-wheels which are operated by the meter-counting mechanism, is varied.

Incandescent Gas-Burners.—Mallol, J., of Birmingham. No. 19,776; Nov. 3, 1900.

Screwed to the upright tube of the burner (as shown) is a socket of inverted conical or cup shape, having a threaded recess at the top, into which screws a cylindrical tube to form the mixing-chamber. Fitting in the top of the mixing-chamber, is a solid inverted cone—preferably formed in two parts, the lower portion an inverted truncated cone of about three-fourths the length of the complete cone, the upper part having a central boss bored to receive the ordinary mantle support. The upper part of the cone has teeth cut in it, extending from the top for a certain distance down; the apertures between the teeth forming the outlets through which the mixed air and gas issues as it is burnt. The teeth form knife-edged ribs down to about the middle of the cone, which become heated when the burner is lighted, and heat the gaseous mixture as it rises up between them. To give the best results, the number and depth of the teeth is important. If the cone is about 1 inch in diameter, then from 34 to 36 teeth give the best results; but if the number of teeth is in this diameter diminished to below 30, the flame is liable to fire-back. A suitable depth for the teeth is $\frac{1}{8}$ inch.

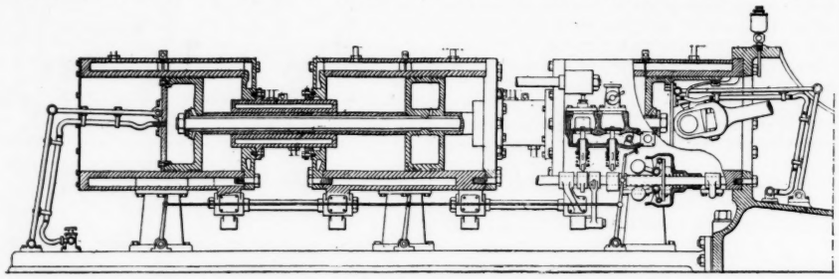
To prevent the possibility of the flame firing-back, and also to ensure the proper mixing of the air and gas, as well as the heating of the gaseous mixture, there is provided round the toothed cone a truncated cone of wire gauze or perforated metal, which is a little larger at its narrowest part than the cone, and rather shorter. The toothed cone projects through it; the diameter of the upper part being about the same as that of the solid cone. The two cones are supported inside the mixing-chamber by three radial arms, which project from the lower part of the cone and fit exactly into the threaded recess of the socket—the arms being formed with a central boss, and fixed to the lower part of the cone by a screw.

To make the bunsen burner part, the patentee provides a tapered screwed nipple suitable for screwing into a gas-fitting, and made with a disc having a rim; the nipple also projecting above the disc. The nipple has a central hole that widens towards the top, forming a sort of tube, in the top of which is spun a thin circle of metal having three small holes, which are of sufficient distance from each other to form separate gas-jets slightly inclining outwardly. The disc part of the nipple is perforated with vertical holes, up which the air passes. Screwed on to the disc is a slightly tapered tube, having an inverted funnel shape at the bottom—thus forming the bunsen burner. The air enters from underneath through the holes in the disc, instead of sideways as usual. The top of the tube is countersunk to a fine edge inside, so as to prevent the formation of a shoulder inside. The mixture of air and gas burns (it is said) without firing-back, notwithstanding its short length. When the tube of the top part of the burner is fitted outside the tube of the bunsen burner, the burner is complete. When used for public lighting or where the noise is no objection, the bunsen burner is made with a single jet, instead of three—the tube part being made higher in this case.

Gas-Engines.—Letombe, L. A., of Paris. No. 15,208; July 26, 1901.

This invention relates to gas-engines of the type described in patent No. 13,325 of 1897, where the volume of air and gas admitted increases as the load or resistance decreases, and is therefore least at full load. The relative proportions between the amount of air and the amount of gas admitted are, however, altered; the greater the load, the greater the proportion of gas contained in the mixture. The mixture, before being exploded, is thus compressed more highly in proportion as the load decreases.

According to the present invention [see illustration], a valve controlling the inlet of air is opened or closed by the governor, in such a manner that the less the load the greater the quantity of air admitted; while the amount of gas admitted will be regulated by the vacuum in the cylinder. The system may be applied to a four-stroke engine, so that a multiple effect may be obtained—that is to say, either four or three explosions are obtained in the four-stroke cycle—by combining the double-acting cylinder (as described in the earlier patent) with one or two single-acting cylinders, placed tandemwise one at each end of the double-acting cylinder; all the pistons being rigidly connected together. Glands are placed between the single and double acting cylinders, so that the single-acting pistons may be removed without unbolting the cylinders, which are rigidly connected together. There



are also means for the continuous circulation of water through the pistons.

Automatic Gas-Igniters.—Thompson, W. P.; a communication from A. Simonini, of Brooklyn, U.S.A. No. 13,579; July 3, 1901.

The patentee points out that investigation has shown that the addition of platinum chloride to rare earths, under certain circumstances, produces a very effective and durable igniting compound; but recent researches prove that other metals of the platinum group may be used for the same purpose—"more effectively, and with greater economy." The percentage in the case of iridium, or rhodium, if used, is as low as 0·019 per cent., and even less.

It has heretofore been proposed, he says, to employ a combination of materials containing a slight trace of platinum metal, as an addition to rare earths, in order to increase the light-giving capacity. These combinations are of no practical value for use in automatic gas-lighters, especially those which are subjected to a continuous exposure to the heat and influence of the flame. As in previous instances, it is found that the compounds most efficient for illuminating purposes, through their high incandescence, are not suited for igniters when placed in a bunsen flame, as they do not readily take up the glow from the preliminary or intermediate heaters. His last researches, however, again prove that the same elements which constitute the integral parts of the best incandescent mantles furnish good igniters, if used in different proportions and in proper relation or arrangement relative to each other.

An igniter must have the property of producing a high temperature, and, to a certain degree, bright incandescence, when started in catalytic action. Further, it must take up with ease the glow from an intermediate heater (such as is hereafter described), and cause it to spread throughout its entire surface. The compounds used for incandescent mantles produce a high temperature and bright incandescence, when started in catalytic action. But they do not readily take up the glow from an intermediate heater; and if they do so in the beginning, they soon lose the property when subjected to the influence of the flame.

It is a rule, so far without exception, that in combinations used for incandescent gas lighting, the elements which are especially adapted for catalytic action are present in very small quantities. A comparatively small increase in the percentage of these elements over the amount that gives the highest efficiency, causes a material decrease of the incandescence; but while the efficiency in that respect decreases, the efficiency as an igniter increases, though only up to a certain limit.

As was pointed out in his previous patent (No. 11,874 of 1900), the variation of the percentage of platinum in combination with the rare earths—thorium oxide, for instance—produces certain results, and shows that it is most important to gradually build up the heat in order to produce a reliable and quick-acting self-lighter. This may be done in different ways. One way would be to paint several lines or spots on an incandescent mantle—the lines or spots preferably overlapping each other a little; and to employ with the mantle a preliminary heater consisting essentially of platinum black. The several lines or spots must be made with solutions having different percentages of rhodium, so that the igniting-line will carry 0·02 per cent. rhodium, the one next to the igniting-line about 0·1 per cent., and the following about 0·2 per cent.

But it is obvious that, by following this method, difficulty will arise in controlling the proportions, as the percentage of rhodium in the different lines not only depends on the percentage of rhodium in the various solutions to be painted on the mantle, but also on the relative quantity of the solution which is put on the mantle. It is of the greatest importance that the igniting portion should have the proper percentage of rhodium incorporated; and it is therefore now found to be preferable to impregnate a separate webbing to carry the igniting compound. Another webbing, to be placed in close proximity to the igniter, may be impregnated with a solution for an intermediate heater, containing (say) from 0·02 to 0·2 per cent. of rhodium; the remainder being thorium nitrate and cerium nitrate in the proportions of 99 to 1.

It is not necessary to impregnate a special webbing for the intermediate heater, as the percentage of rhodium in it may vary more than in the one for the igniter. Therefore, the lighter may be made up in the following manner: A piece of webbing in the form of a ring section—such, for instance, as A, fig. 1—is impregnated with a solution of 99 per cent. of thorium nitrate, 0·98 per cent. of cerium nitrate, and 0·02 per cent. of rhodium chloride. This body forms the igniter. The webbing is dried, and is then painted in a series of lines B, fig 1, or overlapping spots B^1, fig. 3, with a solution for an intermediate heater, containing 99 per cent. of thorium nitrate, 0·8 per cent. of cerium nitrate, and 0·2 per cent. of rhodium chloride. This solution, painted on the igniting-webbing, increases the percentage of rhodium in the

igniting-webbing on the painted spots from 0·02 per cent. to about 0·12 per cent., or less, according to the quantity applied. The ring section of the webbing is painted heavier at the upper end, and gradually lighter toward the lower portion; care being taken not to paint along the lower edge at a distance (say) ⅛ inch from the edge. These painted lines or spots constitute the intermediate heater.

The preliminary heater, designated by C, fig. 2, which shows a mantle with the self-igniter applied thereto, is held in contact with webbing A near the upper end. The preliminary heater consists essentially of platinum-black. The webbing or section which has been treated as above, is bent into a cone and suspended from the top of the mantle, as in fig. 2.

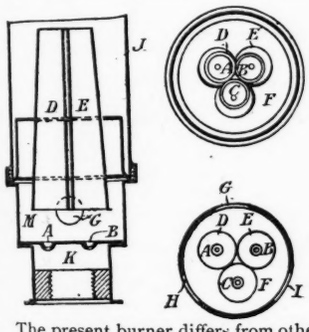
As will be seen from the following statement, it is of the greatest importance to control the percentage of the metal in the limits stated: If the painting of the igniting-webbing is not carried out as prescribed, or if there is no gradual decrease but a sharp falling off of the percentage of rhodium from the upper to the lower end of the webbing, it will be found that, after a comparatively few burning-hours, the glow will not travel from the upper to the lower end, but will stop at the point where the rhodium leaves off; and consequently the gas will not be ignited.

It is to be understood that the rare earths used in the solution are in the form of nitrates, and that preferably the metals are in the form of chlorides. When, however, the lighter is ashed or burned, the nitrates—if nitrates are employed—are changed into oxides, and the metal chlorides destroyed, leaving the metal present.

Bunsen Burners for Incandescent Lighting.—Ihle, G., of Berlin, No. 19,247; Sept. 26, 1901.

In his specification, the patentee says: "In order to increase the thorough mixing of gas and air, and thus the efficiency of incandescent burners, the simplest course adopted is to prolong the passage for both gases. However, since, for the sake of appearance, a certain limit must not be exceeded, no complete diffusion can be obtained by using such burner-lengths as can be employed in practice. The method employed in the present invention, in order to obtain as complete a diffusion as possible even in smaller burner-lengths, consists in a subdivision of the ordinary mixing-tube of a bunsen burner in its longitudinal axis. The cross-section of the parallel chambers thus produced is lessened in comparison with the total cross-section of the burner; while, on the other hand, the surface of the walls is considerably increased. Consequently, the number of molecular concussions against the walls is increased; and the gas molecules will more often strike against the walls in all the chambers than was hitherto the case in the non-subdivided burner. A more frequent change in the direction of the separate molecules will accordingly take place, without the spaced components in the direction of the current suffering considerable loss. The more frequently the direction is changed, the quicker the diffusion takes place."

The practical construction of this invention results in a burner of the shape shown—a vertical section, a plan of the burner after removal of the gauze, and a horizontal section at the height of the air-apertures.



From a common gas-chamber K lead several gas-nozzles A, B, C, each of which opens under a special chamber D, E, F of the burner; the mixing air at the same time being sucked in through the air apertures G, H, I. Partial diffusion between the gas and air takes place in the chamber M; the diffusion being increased in the separate mixing-chambers of the burner, while it is completed in the burner-head J, into which all the mixing-chambers open. An incandescent mantle is suspended above the burner-head in the usual manner.

The present burner differs from others exteriorly resembling it. For instance, several separate and quite independent bunsen burners have been used with separate burner-orifices. There exists, consequently, in that case, a plurality of separate burners which are only combined for the purpose of heating a common incandescent body; while in the present construction a "perfectly uniform burner" is produced. There have also been used a plurality of separate burners, with the difference that the separate burners open into a common burner-head. The present construction differs from this in that a common preliminary mixing-chamber is provided, in which the gas-nozzles, air-apertures, and separate mixing-chambers open, while the preliminary mixing-chamber is missing in the other burner. A plurality of circularly-arranged separate burners have also been used, with a corresponding number of separate incandescent bodies. The patentee does not claim these various combined systems of burners, but "the method for producing in incandescent burners as perfect a mixing of the gas and air as possible, consisting in subdividing the mixing-tube of ordinary bunsen burners into several separate chambers arranged parallel to the burner axis, into which chambers several separate gas-nozzles leading from a common mixing-chamber open for the purpose of increasing by the relative enlargement of the surface of the walls—the number of molecular concussions against the walls thus hastening the diffusion, while the diffusion is completed in the burner-head which is common to all the separate mixing-chambers."

The North Darley Urban District Council have decided to promote a Bill in the ensuing session of Parliament for the provision of a water supply. It is proposed to secure a spring having a maximum flow of 600,000 gallons a day, and a minimum of 90,000 gallons. About 15 miles of mains will be required; and the cost of the scheme is estimated at £7000.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Inclined versus Horizontal Retorts.

SIR,—With reference to my letter, appearing in the "JOURNAL" for Nov. 19, I wish to add that we work here two shifts in the twenty-four hours.

East Greenwich Gas-Works, Nov. 28, 1901. JOSEPH TYSOE.

SIR,—Mr. Tysoe, in his letter to the "JOURNAL" of Nov. 19, has omitted to preface his remarks with the fact that his men work twelve-hour shifts for an average of 6s. 5·6d. per man per day. The rates of wages prevailing at the works of the Gaslight and Coke Company (and also of the Commercial Gas Company, I believe) are: Scoop drivers and firers, 6s. per day of eight hours; stokers, 5s. 9d.; barrowmen, 4s. 9d.—with double pay for two shifts on Sundays.

There are also other unique conditions associated with the employees in the South Metropolitan Gas Company that render any comparison of their and other works misleading. The scheme of profit-sharing evidently has a very important influence upon the amount of work done by every individual in their employ. He evidently works with a better will, and as a consequence accomplishes more. Every man is also, as it were, supervisor of his fellows; he having a personal interest in the economy of both time and materials employed throughout the works. Under the circumstances, therefore, for Mr. Tysoe to say "this is a plain statement of fact, and should I think be sufficient to enable comparisons to be made," and further to caution us that "it should not be forgotten that, when comparing these figures, due allowance must be made for different rates of wages ruling in different districts, as ours I believe are as high as anywhere," and to absolutely disregard the fact that he is getting twelve hours' work out of his men, with very little more pay than others get eight hours' work for, is beyond my comprehension.

There are other conditions associated with the East Greenwich works which render the comparison with an ordinary gas-works impossible. Mr. Tysoe states that one set of machines will draw and charge 2400 mouthpieces, which is practically equivalent to 400 tons of coal per day. In speaking on the late Mr. Frank Livesey's paper, in the year 1894, he stated that the machines at East Greenwich had been working for 1200 days with three weeks intermission for repairs. Presumably these three weeks would be about the middle of the period. Anyhow, it leaves a clear year of machine-working at full load.

To work one set of machinery in an ordinary gas-works with a maximum day's consumption of 4 millions, it would only enable a total annual output of 800 millions to be manufactured; whereas with one set of machinery, Mr. Tysoe gets 1460 millions. The difference is made up by idle time and by the ups-and-downs of daily working, the cost and expense associated with which every gas engineer in charge of an average-sized works knows only too well. For these reasons, again, I say the East Greenwich figures are of no use whatever in endeavouring to ascertain whether machines or inclined retorts are the more economical for the average gas-works to be found in the country.

Take, for instance, my own case—with plant to manufacture 10 millions per day. I should require two-and-a-half sets of machinery, and could not work one set economically from April 28 to Sept. 19, in consequence of my total output being less than 4 millions during this period.

With regard to Mr. Glover's letter, I think I have already given very important facts, which are worth his while pondering over; and if he has the disposition to do so, he is as capable of amplifying them as I am to do it for him. For him to suggest that I am unfair in comparing Mr. Tysoe's figures with those of Nelson, on the grounds that the London wages are higher, and to neglect altogether to take into account the fact that Mr. Tysoe is working twelve-hour shifts, and that his men are also working under unique conditions as compared with any other works, strikes me as being somewhat comical.

I am afraid Mr. Glover will deserve the expression which he applies to himself in the last paragraph of his letter, if he does not brush up his knowledge of modern inclined retort installations. In several of his paragraphs, he is raising questions which were settled five and seven years ago, as to the wear and tear, the make of gas, &c.

As I am dealing somewhat more fully with the general question elsewhere, I must leave Mr. Glover to his own reflections; and I only hope, for his sake, that he will not be backing the lame horse.

I think we are indebted to Mr. Simmonds for the plain statement he has given with regard to the carbonizing costs at his works. He gives *data* that enable us to reduce the basis to tons of coal per man, and thus avoid all error and complication owing to varying rates of wages.

Probably Mr. Glover will be as well acquainted with the conditions existing at Mr. Simmonds's works as he appears to be with the conditions existing at Nelson; and he will be able to discover the difference between the Nelson figures of 10·3d. for all charges, and Mr. Simmonds's, which appear to average about 1s. 4d., and which, by the way, agree very closely with the figures that I have already given for horizontal machinery.

Edinburgh, Nov. 28, 1901. W. R. HERRING.

SIR,—I have to thank Mr. Herring for his reply to my observations on this subject, although I do not see the need for the cudgels.

My purpose in writing will have been served if those—on one side or the other—who take part in the discussion, by giving figures, &c., will follow some settled rule; so that the bottom, facts relating to each system may be arrived at.

Circumstances differ in almost all cases; and unless information is given in full, and local conditions are known, it will be very difficult, in making comparisons, to arrive at correct conclusions.

My object in referring to the machinery in the New Street works, Edinburgh, was to emphasize the point of "local conditions." Having only once visited the New Street works, I remember very little about

them except that they provided an object-lesson on how *not* to use machinery for stoking in gas-works.

Nov. 30, 1901. SCOT.

SIR,—With regard to my letter which appeared in the last "JOURNAL," I omitted to state that all the men are on eight-hour shifts. The weekly wages of the eighteen stokers is given as 35s. 8d. This should have been £35 8s., which is the total wages of the stokers required for the twelve beds.

Bury, Nov. 30, 1901. HY. SIMMONDS.

Naphthalene.

SIR,—Referring to the letter of Mr. P. C. Holmes Hunt in your last issue on the above subject, and to the revival of the naphthalene question, may I suggest that all the vapours usually carried by coal gas, including benzol, can be removed by reducing the temperature sufficiently, and probably a large percentage of the naphthalene vapour which usually escapes absorption, or remains uncondensed at the works, might be arrested by refrigeration; but that hitherto it has not been deemed advisable, for obvious reasons, to so treat coal gas.

That it is not sufficient alone to reduce the temperature of the gas at the works to the temperature obtaining in the distributing mains, we have ample proof. There must be solvents present in the gas, preferably in the form of vapours having approximately the same vapour tensions as naphthalene.

If the crude coal gas contained a sufficient proportion of these condensable vapours, having a solvent action on naphthalene, the entire removal of the naphthalene vapour at the condensers would be a comparatively simple matter. This, however, is not usually the case, especially where certain classes of coal are used. An analysis of the tar reveals the fact that certain oils—corresponding to the condensable vapours required for naphthalene removal—are practically absent in the crude gas. The scrubbing power of the condensers, even at low temperatures, therefore, becomes limited; hence the necessity for introducing solvent oils in scrubbers specially set apart for the removal of naphthalene. That this can be done in a practical way, has been demonstrated both in this country and in Germany; and I venture to think this plan will soon be regarded with more favour than has hitherto been the case.

There is another method of preventing naphthalene deposits, which I have proved to be entirely successful, and which involves perhaps less outlay on apparatus, and has the advantage of being extremely simple to work. The plan to which I refer has been in operation for over twelve months at the West Bromwich Gas-Works; and naphthalene deposits are no longer existent. With this method, condensable hydrocarbon vapours are introduced into the finished gas, and the formation of naphthalene crystals is prevented. The volume of the vapour introduced can be readily regulated to the requirements of the gas. The process requires practically no labour, and very little supervision.

Both the methods I have thus briefly and imperfectly described, were brought before meetings of gas engineers in 1896; both are in use in this country and in Germany; either can be readily applied; and the results are certain.

There is no further need for the intolerable nuisance, loss of consumers, or loss of prestige which often follows upon repeated recurrences of naphthalene stoppages.

Norwich, Nov. 27, 1901. THOS. GLOVER.

SIR,—In reference to the letter of Mr. P. C. H. Hunt on this subject, in your last issue, I venture, perhaps at risk of repetition, to offer a few remarks.

When, some eight or nine years ago, I was entrusted with the practical investigations at these works in regard to the prevention of naphthalene, the difficulty, so far as obstructions in the plant and works mains were concerned, had been remedied by Mr. C. E. Botley; and my attention was constantly directed more especially to the distributing canalization. The trouble from naphthalene was always with us more or less; but the greatest trouble followed a sudden change, or fall, of temperature. This led me to the same conclusion as was arrived at by Mr. Hunt—viz., that it was desirable to subject the gas in the course of manufacture, and when in contact with a solvent (as tar), to the lowest temperature to which it would afterwards be exposed in distribution. The temperatures prevailing in distribution under various conditions were carefully ascertained; and the condensing plant was worked precisely as now suggested by Mr. Hunt. The condenser then used was of the water-tube type, fitted up so as to be worked in either direction, in order to be kept in efficient condition—somewhat as recently described by Mr. Carpenter. I regret to say, however, that the trouble in the district was not obviated, as the figures show for three years after this point was attended to. For the years 1893, 1894, and 1895 respectively, they were: Total number of complaints, 4948, 4167, and 7125. It, therefore, became necessary to prevent, if possible, the collection and deposition of naphthalene in the canalization; and success in this direction has been attained—the figures for the last three years, 1898, 1899, and 1900, for complaints of all kinds being: 616, 618, and 422.

There is no doubt that the naphthalene question is a very important one in gas supply; and it is remarkable that it should have taken so many years for the gas profession generally to arrive at this conclusion. And now that there are several means by which the trouble can be minimized, if not altogether prevented, it is strange to still find the nuisance unabated in many towns.

In the general consideration of the question of naphthalene, condensation has, I think, always been rightly regarded as of great importance. But it has also to be remembered that the amount of naphthalene produced per 1000 cubic feet is evidently more than it used to be; and the area of condensing plant in proportion to the gas manufactured has, in many cases, become very much modified. In many towns, naphthalene is not a source of trouble except in summer time; and I am of opinion that aqueous vapour plays an important part in this connection, because on the lowering of the vapour tension due to a fall in temperature, water is deposited, and with it (the conditions being favourable) naphthalene, and this is the more so when a proportion of carburetted water gas is used. Following the method of systematic slow and thorough condensation described by Mr. Hunt, in the summer time, owing to higher temperatures, the gas will contain more naphthalene than in winter.

In conclusion, I would suggest that no system or method of dealing with naphthalene is likely to be successful when there are existing deposits of this substance in the works or district. Alterations in the manufacture may remedy the trouble so far as the works and storage are concerned, but will increase the trouble in the district. This has, I believe, been a frequent experience; but it is certain that efficient condensation does reduce the amount of naphthalene in the gas, and consequently it is then not so difficult a matter to retain the remainder during distribution.

Hastings, Nov. 30, 1901. CHAS. F. BOTLEY.

SIR,—The alteration of a stop in my letter published in the "JOURNAL" for Nov. 26, materially alters the sense intended. The sentence should read: "Recently none." "From the condensers the gas passes." There has been no trouble at our works with naphthalene for several years past.

Nov. 28, 1901. A GAS AMATEUR.

Comparative Cost of Gas and Electric Lighting.

SIR,—In comparing the relative cost of electric arc lighting and incandescent gas, in his paper at the recent meeting of the Southern District Association, Mr. Onslow is more than generous to the rival illuminant. In fact, he credits electricity with double the duty that its own *sober* advocates claim for it.

Mr. Onslow asserts that, with his high-pressure incandescent lights, yielding 31 candles per foot, gas at 2s. 6½d. per 1000 cubic feet equals electric arc lighting at 2d. per unit; thus allowing to the latter a duty of 2000 candles per unit, or a power expended for only 0·5 watt per candle. Now your contemporary the "Electrician," in a leading article on "Public Lighting," in its issue for Oct. 20, 1899, stated that the power absorbed "per mean spherical candle power," for arc lights, without globes, was from 1 to 1·25 watts with alternating current, and from 0·75 to 0·9 watt with continuous current. If we take the mean of these figures as the watt per candle, it agrees very closely with Mr. Dibdin's allowance of 500 watts for an arc light of 460-candle power, and receives confirmation from other reliable experts (see "JOURNAL," Vol. LXIII., p. 526, and Vol. LXIV., p. 875).

On this basis, Mr. Onslow's comparison becomes 5s. 2d. per 1000 cubic feet for gas equal in illuminating value to electricity at 2d. per unit. Even without high pressure, it is remarkable, and not sufficiently realized, how much more economical is incandescent gas than electric arc lighting. With a well-fitting mantle, either the ordinary "C" burner with chimney or the Kern burner without chimney, will develop 20 candles per cubic foot of gas—that is, an illumination of 20,000 candles for 1000 cubic feet of gas. To produce equal illumination by means of the electric arc, 20 units of current are required; from which data the relative value of the two illuminants at local prices can be readily ascertained.

Nov. 29, 1901. J. T. S.

Coal-Stack Fires.

SIR,—It should have been mentioned in my letter published in the last "JOURNAL" that the coal used at these works is principally black bed; all of it being unscreened—lumps, cobbles, nuts, and dust, just as obtained in working, or to use the common term "as gotten."

It will be argued that the conditions of coal-storage on board a ship are very materially different from those upon land. In the latter, drainage is provided for, and air space; while in the former these are wanting—the whole mass being enclosed, and also being subjected to a continuous shaking and motion.

However, the findings of the Inspectors of the Marine Department in the report already mentioned, relative to coal storage on land—viz. at the Sydney Gas-Works—at all events, showed the portion of the desirable height to be 17 feet.

The saturation of the mass by water is a principle common to both land or sea—either fresh or salt water being equally serviceable.

One has listened to the cracking of cannel coal in an open stack upon a brilliant summer's day, when the sun has been shining upon it intensely; but I have not heard of cannel coal firing from spontaneous combustion.

Huddersfield, Nov. 28, 1901. EDWARD A. HARMAN.

Important to Statutory Gas and Water Companies.

SIR,—It is well known that railway companies generally have in the immediate neighbourhood of their booking offices notice-boards with printed lists pasted thereon, and giving short lists of particulars of offences against their bye-laws, and penalties for same. I do not know of any gas or water companies who publish the same class of notices; and therefore I think that the following matter will be of interest to many of your readers—particularly to those whose companies undertake the maintenance of the public lamps.

Most Private Acts of statutory gas and water undertakings incorporate the Companies Clauses Consolidation Act of 1845, of which section 145 reads as follows:—

> The company shall publish the short particulars of the several offences for which any penalty is imposed by this or the Special Act, or any Act incorporated therewith, or by any bye-law of the company affecting other persons than the shareholders, officers, or servants of the company, and of the amount of every such penalty, and shall cause such particulars to be painted on a board, or printed upon paper and pasted thereon, and shall cause such board to be hung up or affixed on some conspicuous part of the principal place of business of the company; *and where any such penalties are of local application, shall cause such boards to be affixed in some conspicuous place in the immediate neighbourhood* to which such penalties are applicable or have reference; and such particulars shall be renewed as often as the same, or any part thereof, is obliterated or destroyed; and no such penalty

shall be recoverable unless it shall have been published and kept published in the manner hereinbefore required.

A few months ago, I had, on behalf of the Llanelly Gaslight Company, occasion to prosecute a gas-fitter for having, unknown to the Gas Company, and contrary to section 15 of the Gas-Works Clauses Act, 1871, connected a gas-meter to a pipe connected to a main of the Gas Company.

The defending Solicitor elicited, during cross-examination, that the Gas Company had not hung up in their office, or anywhere in their area of supply, a list of short particulars of offences and penalties, as required by section 145 of the Companies Clauses Consolidation Act; and having this admission that no such publication had been made, the defending Solicitor asked for, and got the case dismissed, but without costs.

Since then the Gas Company have had a short list of offences and penalties printed, and have now a copy hung in a prominent place in their office, and also have had a large number of copies pasted on boards and hung on the arms of lamp-pillars in various parts of their district of supply.

I give below, for the benefit of your readers, a copy of the printed notice of short particulars of the several offences and penalties.

Llanelly, Nov. 30, 1901. ALBERT R. CAWLEY.

[ENCLOSURE.]

THE LLANELLY GASLIGHT COMPANY

Hereby give notice, under section 145 of the Companies Clauses Consolidation Act, 1845, that they will sue for penalties under the Gas-Works Clauses Acts, 1847 and 1871, for the following offences:—

Section 18, Gas-Works Clauses Act, 1847: For fraudulently using gas, injuring meters, &c.
Penalty.—To be paid to the Gas Company, the sum of £5 (five pounds) for every offence; also the sum of £2 (two pounds) for every day such offence continues.

Section 19, Gas-Works Clauses Act, 1847: For wilfully damaging, destroying, or removing any pipe, pillar, post, plug, lamp, or other work, or wilfully extinguishing any public lamp, light, or improperly using any gas supplied by the Gas Company.
Penalty not to exceed £5 (five pounds), in addition to damage done.

Section 20, Gas-Works Clauses Act, 1847: Any person who shall carelessly or accidentally break, throw down, or damage any pipe, pillar, or lamp belonging to the Gas Company or under their control, shall pay to the Gas Company for damage done a **Penalty** not to exceed £5 (five pounds).

Section 15, Gas-Works Clauses Act, 1871: For connecting or disconnecting the gas-meters without proper notice.
Penalty not to exceed £5 (five pounds).

Section 21, Gas-Works Clauses Act, 1871: For obstructing the representative or representatives of the Gas Company from entering premises to make inspection of meters, fittings, and other works.
Penalty not to exceed £5 (five pounds).

Section 38, Gas-Works Clauses Act, 1871: For wilfully, fraudulently, or by culpable negligence, injuring pipes, fittings, &c., or taking gas by artificial means.
Penalty not to exceed £5 (five pounds), in addition to damages.

Section 146, Companies Clauses Consolidation Act, 1845: For pulling down, obliterating, or injuring this board or notice.
Penalty.—Five pounds and damages.

(*Signed*) EDWIN MORGAN, Chairman.
(*Signed*) ALBERT R. CAWLEY, Manager and Secretary.

(L. S.)

Nov. 30, 1900.

Incandescent Gas Lighting in Winchester.—The Winchester Water and Gas Company have again been successful in securing the contract for three years for the incandescent lighting for the whole of the city (including the newly-added area), and other means of high-power lighting at important road junctions, in opposition to the local Electric Light Company.

Brixham Water Supply.—The ratepayers of Brixham met yesterday week to consider the District Council's water schemes, to which reference was made in the "JOURNAL" last Tuesday. After considerable discussion, the proposal to obtain water from Paignton was defeated by a considerable majority. The meeting was, however, by no means enthusiastic in support of the suggestion put forward by the Council to collect water at a local source; and, as an amendment to a resolution in favour of this scheme, a Committee were appointed to confer with the Council and assist them in providing a supply.

Portsmouth Water Company.—The half-yearly general meeting of the Company was held last Thursday—Mr. W. Grant, J.P., in the chair. The report of the Directors, some particulars from which were given in the "JOURNAL" last week (p. 1408), having been presented, the Chairman moved its adoption. He congratulated the shareholders upon the marvellous manner in which the revenue of the Company had recovered from the concession of £5000 per annum voluntarily made by reason of basing the water-rates upon the assessment instead of the rental value of the property. The income upon that head was now only £1766 less than it was formerly, which he admitted was due rather to the reassessing of the borough than to ordinary growth. The proposal to acquire their undertaking by the town came to nothing, though they had been treated with the utmost courtesy by the Water Committee of the Corporation; but he supposed their hearts had failed them at the last moment. As, however, they had declined to buy the undertaking at a fair price, the Company would be content to go on as they had been doing in the past. Lieut.-Col. Owen seconded the motion, and it was carried. The payment of the dividends recommended was then declared, and the proceedings closed.

PARLIAMENTARY INTELLIGENCE.

NOTICES GIVEN FOR BILLS (SESSION 1902) RELATING TO GAS AND WATER SUPPLY.

(*Continued from p.* 1390.)

Abercarn Gas.—The Abercarn Urban District Council intend to apply for authority to purchase the undertaking of the Abercarn and Newbridge Gas and Water Company, and supply gas in the urban district of Abercarn and the parish of Mynyddislwyn. Power will be sought to maintain and extend the existing gas-works and construct others, supply stoves and fittings, and sell gas in bulk.

Abertillery Urban District Council.—Application will be made by the Abertillery Urban District Council for authority to construct additional water-works, and compulsorily purchase lands and easements. It is proposed to take the waters of the Tillery Brook. The Bill to be promoted will include provisions in regard to the supply of water meters and fittings and the sale of water for trade purposes, as well as to the supply of electricity and the charge therefor.

Bedford Water.—Application will be made by the Bedford Corporation for authority to construct new water-works, comprising a well and pumping-station in the parish of Henlow, a reservoir in the parish of Eastcotts, and two aqueducts connecting the new with the existing works. Provision will be made for the compulsory purchase of lands, the appropriation of water, the protection of the sources of supply, &c. Additional borrowing powers will be sought.

Birkenhead Corporation.—In a General Purposes Bill to be promoted by the Birkenhead Corporation, clauses will be inserted giving them power to enter into agreements for the supply of electricity within and beyond the borough, and to wire premises for electric lighting, prescribe the meters and fittings to be used, and alter their charges; and the Corporation will ask for an extension of the time specified for the construction of water-works under their Act of 1881. Further money powers will be sought.

Birmingham Corporation (Water).—The Birmingham Corporation will apply for an extension of the time authorized by their Water Acts of 1892 and 1896 for the completion of the works therein specified in connection with their Welsh scheme, and will seek authority to lay down additional line or lines of pipes to form part of the several conduits sanctioned by the first-named Act without limitation as to time. Other provisions in the Bill to be promoted will relate to the diversion of roads, the making of bye-laws for securing the purity of water, the temporary discharge of water into streams, the purchase of land, and the application of moneys to the purposes specified.

Bristol Water.—Authority will be sought by the Bristol Water Company for the construction of additional works in the county of Somerset, and in the city and county borough of Bristol. They will comprise two covered service reservoirs, two aqueducts or pipe-lines, and a road, together with subsidiary works. The Company will require to take certain common or commonable lands compulsorily; and they will ask for additional capital.

Buxton Urban District Council.—Authority will be sought by the Buxton Urban District Council to adopt, manufacture, sell, and supply within their district "any other substitute for coal gas," and to adopt any patent or other kind of gas in substitution for, or to supplement, coal gas or electricity as at present supplied by them, and to supply it for motive or other power, heating, or for any other purpose to which such gas or patent can be applied, except for illumination, and to let on hire machinery and apparatus of any description for, or in connection with, these objects, or any of them, and to levy and recover rates, rents, and charges in respect thereof. They will likewise seek authority for the construction of two additional reservoirs and other works, comprising fine aqueducts and a new road. Provision will be made for taking and diverting the waters of springs and streams, compulsorily acquiring lands and easements, protecting the sources of water from pollution, and increasing the charges for water.

Consett Water.—The Consett Water Company will apply for authority to construct a reservoir in the parish of Hexham, together with conduit or catch water, three lines of pipes, a pumping-station, a service-tank, and a tramroad in that and other parishes. Power will be sought to take water from the Beldon, Quickcleugh, and Nookton burns and their tributaries; and provision will be made for the supply of compensation water. The Company wish to be authorized to acquire compulsorily certain lands for protecting their water from pollution, alter their scale of charges, and supply water by meter and in bulk. The Bill to be promoted will include arrangements for the joint construction of works by the Company and the Weardale and Shildon District Water-Works Company, and for the amalgamation of the two undertakings. Additional capital will be required.

Darley Dale Water.—Application will be made by the Urban District Council of North Darley, in Derbyshire, for authority to construct water-works, comprising four wells, six conduits or pipe lines, filter-beds, &c., for the supply of their district. Provision will be made for protecting the sources of supply and preventing waste. Additional borrowing powers will be sought.

Devonport Corporation Water.—Application will be made by the Devonport Corporation for power to acquire the undertaking of the Devonport Water Company on terms to be agreed upon or settled by arbitration. The Bill to be promoted will make better provision for the supply of water and fittings, meters, &c., and preventing waste. Authority will be sought to raise more money.

Devonport Water.—The Devonport Water Company will apply for authority to construct a reservoir, aqueduct, and other works, in the county of Devon. The reservoir will be situated in the parish of Lydford, and be formed by means of a dam across the River Cowsic; and it will be connected by an aqueduct or pipe-line to the Company's existing tank on their Cowsic leat. Certain lands in the parishes of Lydford and Walkhampton are proposed to be acquired; and the water of the Cowsic and its tributaries are to be impounded.

Application will be made for an extension of the time specified in the Company's Act of 1897 for enlarging the Crown Hill storage reservoir, and carrying out the works connected therewith. Other provisions of the Bill will relate to agreements to be made with land, mill, and mine owners affected by the scheme, with local authorities and other public bodies for the sale of water in bulk, and with the Admiralty for its supply to the Navy and the Dockyards. Additional capital will be required.

East Worcestershire Water.—The East Worcestershire Water Company wish to extend their limits of supply so as to include the parish of Feckenham, in the county of Worcester, and the parishes of Ipsley, Studley, and Sambourn, in the county of Warwick; and they will apply for the necessary authority, as well as for power to construct a storage reservoir at Chadwick, in the parish of Bromsgrove. The Bill will contain further provisions as to the sale of water in bulk and by meter; and the Company will ask therein to be exempt from supplying premises with water until arrears of rates have been paid. Additional capital will be needed.

Finedon Water.—The Finedon Urban District Council have notified their intention of applying for authority to construct water-works, consisting of a well and pumping-station, a covered service reservoir, an aqueduct or pipe-line, and a water-tower, in their district. The Bill will contain provisions and regulations in regard to the supply of water, the prevention of waste, rates and charges, &c. Additional borrowing powers will be sought.

Grand Junction Water.—The proposals of the Grand Junction Water-Works Company were outlined in the article dealing with the projected water legislation for London which appeared last week on p. 1394.

Higham Ferrers and Rushden Water Board.—Parliamentary sanction will be sought for the formation of a Joint Water Board, to be composed of representatives of the Corporation of Higham Ferrers and the Rushden Urban District Council, to whom is to be transferred the undertaking of the latter body. The Board will exercise the powers granted to the Higham Ferrers Water Company by their Act of last year, with or without modification; and the Company will be dissolved. The price to be paid for the works is to be settled by agreement or by arbitration. It is proposed to ask for power to construct works, and supply water in the above-named towns and elsewhere. Authority to raise money will be sought.

Huddersfield Corporation.—In an application which the Huddersfield Corporation will make for various powers, they will ask for the revival of those granted by the Huddersfield Water-Works Acts of 1871, 1890, and 1896 in respect of the Butterley and Blakeley reservoirs and the Shepley tank, and will seek authority to construct catch-water and conduit to connect the Wessenden Head and Deerhill reservoirs. They will also ask for the repeal of certain sections of the Huddersfield Water Act, 1869, and their Act of 1890 in regard to compensation water; and other provisions will be made. More money will be required.

Kent Water.—The scope of the application intended to be made by the Kent Water Company was noticed last week on p. 1394.

Knaresborough Improvement.—In an Improvement Bill to be promoted by the Knaresborough Urban District Council, clauses will be inserted giving the Council power to purchase certain lands and buildings for the general purposes of their gas undertaking; to alter and enlarge their works; to make provisions in regard to the price, quality, pressure, and testing of gas; to deal in fittings, &c.; to hold patent rights for the distribution of all kinds of gas and the conversion of residual products; and generally to carry on the business of a gas undertaking. The Council will also apply for authority to make provision for protecting their water supply from pollution, preventing waste, selling water in bulk, &c. Power to raise more money will be applied for.

Leicester Corporation.—The Corporation will apply for authority to manufacture and store gas and convert residual products on certain lands in the parish of Thurmaston South, and lay gas-mains therefrom to the borough. Additional borrowing powers will be sought.

Limpsfield and Oxted Water.—The Limpsfield and Oxted Water Company desire authority for the construction of additional works, comprising a service reservoir, having a superficial area of about 10,000 feet, in the parish of Limpsfield, and a well or wells, a pumping-station, and a line of pipes in the parish of Tatsfield. Application will be made for an extension of the limits of supply to include the parish of Cowden, and for authority to suppy water in bulk and raise further capital.

Liverpool Corporation.—It is the intention of the Liverpool Corporation to apply for power to acquire, by compulsion or agreement, some 6252 acres of land within the drainage area of their Rivington reservoirs and works, for the protection of those works and the sources of water supply in connection therewith. More money will be required.

London Street Subways.—The proposals of the London County Council in regard to the construction and use of street subways are noticed on p. 1472.

London Water (Purchase, &c.).—The Bills to be introduced by the Government and the London County Council next session for the acquisition of the undertakings of the London Water Companies and the Staines Reservoirs Joint Committee were noticed last week, on p. 1394.

Margate Corporation Water.—Application will be made by the Corporation of Margate for power to extend their limits of supply so as to include Monkton and other parishes in Kent, and to make and maintain new works, comprising a pumping-station, with wells, &c., in the parish of Wingham, two adits, and two conduits or pipe-lines. Provision will be made for securing the purity of the water. It is proposed to partially repeal powers possessed by the Canterbury Gas and Water Company, the East Kent District Water Company, and the Mid-Kent Water Company. Additional borrowing powers will be required.

Menai Bridge Urban District Council.—Application will be made by the Menai Bridge Urban District Council for authority to construct additional water-works, comprising an open storage reservoir and overflow weir intercepting and impounding the waters of the Afon Rhyd Eilian stream, a conduit or pipe-line in the parish of Llandysilis, and a hydraulic ram and feed-pipe. Provision will be made for the acquisition of land, easements, and water and other rights, the sale of water in bulk by meter, and the levying of rates and charges.

Newcastle and Gateshead Water.—The Newcastle and Gateshead Water Company intend to apply for authority to make and maintain new conduits in Northumberland and the city and county of Newcastle-upon-Tyne. Among other things, the Bill to be introduced will provide for the revival of powers and an extension of time for the completion of certain works authorized by the Newcastle and Gateshead Water-Works Act, 1894; for enlarging the Catcleugh reservoir; for new service-tanks and mains; for the diversion of pipes sanctioned by that Act and the Newcastle and Gateshead Water-Works Act, 1898; and for the prevention of contamination of the water. The existing capital is to be consolidated, and more will be applied for.

Newport (Mon.) Corporation.—The Corporation of Newport (Mon.) will apply for an extension of time for the completion of the works authorized by their Act of 1897, and by the Newport Water-Works Act, 1887; also for sanction for an aqueduct authorized by the first-named Act as it has been constructed, and power to maintain and use it.

North Warwickshire Water.—The North Warwickshire Water Company will seek authority to define the terms and conditions upon which they shall transfer a portion of their undertaking to the Corporation of Coventry, and to specify the manner in which the purchase money is to be applied. In the Bill to be promoted, provision will be made for extending the area of supply, authorizing the Company to purchase lands by compulsion or agreement, and regulating their capital and borrowing powers.

Nottingham Corporation.—The Nottingham Corporation will seek power to construct additional water-works, comprising two covered service reservoirs and five aqueducts or pipe-lines, and extend their limits of supply so as to include the parishes of South Wilford and Ruddington. They will also ask for authority to make bye-laws for securing the safety of, and prevention of fires in, premises supplied, or about to be supplied, with electricity, to supply electrical energy in bulk to outside authorities, to accept a transfer of an electric lighting undertaking in a district adjoining the city, and supply energy in such district, &c. Additional borrowing powers will be needed.

Rhondda Urban District Council.—Application will be made by the Council for, among other things, an extension of time for the purchase of lands and the completion of works authorized by the Ystradyfodwg Urban District Council (Gas and Water) Act of 1896 and the Council's own Act of 1899. They will also ask for power to construct new water-works, consisting of a well and pumping-station and two sets of aqueducts or pipe-lines; and also to prescribe, regulate, and inspect gas fittings. More money will be required.

Street Water.—The Urban District Council of Street require authority to construct a well and reservoir or tank in the parish of Rodney, Stoke, in Somersetshire, with various auxiliary works, and to impound waters. Certain lands and easements are to be purchased compulsorily. Additional borrowing powers will be sought.

Swansea Corporation Water.—The Swansea Corporation will apply for an extension of the time specified for the completion of works authorized by their Act of 1892; and also for power to purchase additional lands. More money will be required.

Ticehurst Water.—Authority will be sought for the incorporation of a Company to construct works and supply water in Ticehurst, Wadhurst, Burwash, Salehurst, Etchingham, Hurst Green, and Robertsbridge, in Sussex. Provision will be made for the compulsory purchase of land, the supply of fittings, the prevention of waste, the sale of water in bulk, &c.

Weardale and Shildon Water.—Application will be made by the Weardale and Shildon Water Company for authority to construct additional works, comprising two reservoirs and various pipe-lines, &c. Provision will be made for appropriating the water of several streams, for making compensation in respect thereof, for discontinuing the supply of compensation water from the existing works, and for protecting the sources from pollution. The Bill will provide for the amalgamation of the Company with the Consett Water Company. The existing capital is to be consolidated and converted, and more will be applied for.

West Hampshire Water.—Authority will be sought by the West Hampshire Water Company to purchase the undertaking of the Barton-on-Sea Water Company, and extend their limits of supply so as to include certain parishes in the county of Southampton. It is intended to ask for an extension of the time specified for taking lands, constructing works, and supplying water to the district defined in that Company's Act of 1899. Further money powers will be needed for the scheme.

Whitstable Improvement.—In a General Purposes Bill of which notice has been given by the Whitstable Urban District Council, they will seek authority for the transfer to them of the undertakings of the Whitstable Water and Gas Companies, with all the powers usually granted to suppliers of gas and water. The Companies will, of course, be dissolved and wound up. Further provisions will be made in regard to the supply of both water and gas; and additional borrowing powers will be sought.

Wolverhampton Corporation.—Notice has been given by the Wolverhampton Corporation of their intention to re-introduce their Bill of last session to sanction the construction of additional water-works. They will consist of two pumping-stations at Worfield, a reservoir at Tettenhall, and another at Sedgley, two aqueducts connecting these works, and a tramroad. Power will be sought to appropriate and use all such streams and waters as can be collected by the proposed works, and to make provision for securing purity and for the supply of water to the owners of any well or other watering-place situated within 1½ miles of the authorized wells (or such other distance as may be prescribed), the supply of water from which shall fail in consequence of the proposed works, or for the payment by the Corporation of compensation to the owners. The Bill will contain provisions for the Corporation to enter and inspect any lands situate within such distance of the proposed wells as may be specified, for prohibiting

the sinking of those wells and the construction of works in those lands which would intercept water from the works of the Corporation, and for enabling them to take and use any water so intercepted. Application will be made for authority to borrow more money and to increase the water reserve fund.

Wrexham Water.—The Wrexham Water Company will apply for power to construct a storage reservoir and other works, take water from the Pentrebychan Brook and its tributaries, and purchase houses, buildings, and land in the vicinity to prevent contamination of the water. The existing capital is to be consolidated and converted, and more will be applied for.

Ystradfellte Water.—It is proposed to form a Joint Water Board, consisting of representatives of the Neath Rural District Council and the Aberavon Corporation, with or without representatives of the Neath Corporation, the Briton Ferry Urban District Council, and other authorities; and application will be made for the necessary sanction. It is intended to construct water-works consisting of a storage reservoir to be formed by an embankment crossing the River Tringarth, five others in various places, and the necessary conduits or pipe-lines. Provision will be made for the apportionment of the water, its supply in bulk, the prevention of pollution, the levying of rates and charges, and the raising of money.

PROVISIONAL ORDER APPLICATIONS (SESSION 1902).

To the Board of Trade, under the Gas and Water Works Facilities Act, 1870.

Beccles Water.—The Beccles Water Company intend to apply for authority to raise additional capital, purchase more land, and make contracts for the supply of water in bulk or otherwise beyond their limits.

Bothwell and Uddingston Gas.—Application will be made by the Bothwell and Uddingston Gas Company, Limited, for authority to maintain, continue, and construct gas-works, and carry on the usual business of a gas company. More capital will be required. The Company will ask for the repeal or amendment of certain provisions of the Hamilton New Gaslight Act, 1846, and the Hamilton Burgh Act, 1878, authorizing the Corporation of Hamilton to supply gas within the limits to be specially defined in the Order as the Company's district.

Bridge of Earn Gas.—The Bridge of Earn Gas Company have notified their intention of applying for authority to maintain and continue their existing works, alter or extend them, and supply gas in the village of Bridge of Earn and parts of the parishes of Perth and Forteviot. They will also seek permission to take a supply of gas in bulk from the Perth Corporation, and discontinue the present works. Additional capital will be required.

Bridgend (Glam.) Gas and Water.—The Bridgend Gas and Water Company will apply for power to increase their capital, amend their Act of 1869 and their Order of 1875, and incorporate therewith some of the clauses of the Companies Clauses Consolidation Act, 1845, and the Companies Clauses Acts, 1863 and 1869.

Burnham and District Water.—The Burnham, Dorney, and Hitcham Water Company, Limited, will apply for authority to extend their limits of supply so as to include the parishes of Taplow, Dorney, and Boveney, in Buckinghamshire. Additional capital will be required.

Chapel-en-le-Frith Gas.—Notice has been given by Mr. W. Walker, of Gomersal, of his intention to apply for authority to maintain and enlarge the existing gas-works, erect new ones, and extend the limits of supply. The usual powers granted to gas companies will be sought.

Cirencester Gas.—The Cirencester Gas Company, Limited, will apply for power to raise additional capital, and amend or repeal all or some of the provisions of their Order of 1891 and any other Act or Order relating to the Company.

Clay Cross Gas.—Application will be made by Messrs. W. & T. H. Jackson, carrying on business as the Clay Cross Company, for authority to continue the existing works, and construct and maintain others on a new site, for the supply of gas in the urban district of Clay Cross, and certain parishes in the county of Derby. The usual powers will be sought; and the existing capital will be defined, and more applied for.

Croft (Leicestershire) Water.—Notice has been given by Mrs. L. E. McLaren of her intention to apply for authority to construct and maintain works and supply water in the parish of Croft, in Leicestershire. The usual powers granted to water companies will be sought.

Garw and Ogmore Gas.—Application will be made by the Garw and Ogmore Gas Company for authority to alter and increase their borrowing powers under the Garw and Ogmore Gas Act, 1891.

Goring and Streatley Gas and Water.—Application will be made by the Goring and Streatley District Gas and Water Company for power to raise additional share and loan capital.

Harwich Gas.—Application will be made by the Harwich Gas Company for authority to raise more capital and construct additional works for the manufacture and storage of gas on a piece of land in the parish of St. Nicholas, Harwich, now in their occupation.

Hornsey Gas.—The Hornsey Gas Company intend to apply for authority to raise more capital, extend the northern boundary of their district, and purchase additional land, erect new works, &c.

Knutsford Light and Water.—Application is intended to be made by the Knutsford Light and Water Company for further powers in respect of their undertakings, and for authority to accept the transfer to them of the electric light undertaking of the Knutsford Urban District Council, and apply for electric lighting powers. Additional capital will be required.

Marlow Water.—The Great Marlow Water Company intend to apply for power to construct a service reservoir in the parish of Wooburn, in Buckinghamshire, a well and pumping-station in that parish and another in Little Marlow, and two conduits or pipe-lines. Provision will be made for impounding water, acquiring lands by agreement, &c. Additional capital will be needed.

Mid-Kent Water.—The Mid-Kent Water Company will apply for power to construct a well and pumping-station in the parish of Charing, and an aqueduct or pipe-line therefrom to the service reservoir authorized by the Company's Act of last year. Authority will be sought to extend the limits of supply so as to include the parishes and places of Hollingbourne, Lenham, Leeds, Broomfield, and Harrietsham, all in Kent.

Pinxton Water.—The Pinxton Coal Company, Limited, intend to apply for power to pump, store, and supply water for public and private purposes in a portion of the parish of Pinxton, in Derbyshire, by rates and charges therefor, and manufacture and supply fittings, &c.

Portsmouth Water.—Power will be applied for by the Borough of Portsmouth Water Company to construct and maintain new works, consisting of a line of pipes in the parish of Wymering, and to purchase lands by agreement. Additional capital will be required.

Rothwell Gas.—Application will be made by the Rothwell Gas Company for authority to raise any further sums, not exceeding in the whole £20,000 (including premiums), by the issue of shares, and one-fourth of this amount on loan, for the purposes of their undertaking.

Skegness Gas.—Application will be made by the Skegness Gaslight and Coke Company, Limited, for powers to maintain, continue, and construct works; manufacture and supply gas, fittings, engines, &c.; and make or obtain and supply Mond or other producer gas, and the means of producing artificial light of any kind. Authority will be sought to increase the share and loan capital.

Staines and Egham Gas.—The Staines and Egham District Gas and Coke Company, Limited, will ask for authority to acquire by agreement certain lands in the parish of Egham, for the purpose of constructing works for the manufacture of gas and residual products on a new site. Application will be made for further capital and borrowing powers.

Syston and Thurmaston Gas.—Authority will be sought by the Syston and Thurmaston Gas Company to maintain and continue the existing, and construct new, works, and manufacture and supply gas in the urban district of Thurmaston and several parishes and townships in Leicestershire. The usual powers will be applied for. The capital and borrowing powers of the Company are to be defined and regulated.

Uckfield Water.—The Uckfield Water Company will apply for authority to raise additional capital and extend their limits of supply so as to include the parishes of Maresfield, Buxted, Framfield, Little Horsted, Isfield, and Fletching, in Sussex; also to sell water in bulk.

Wellingborough Gas.—Application will be made by the Wellingborough Gas Company for authority to acquire land for the erection of works for the manufacture of gas, and also to supply fittings and other appliances, including engines and dynamos, &c.

Woodford Halse Water.—Application will be made by the Woodford Halse Water Company, Limited, for authority to maintain, continue, and enlarge their existing works, supply water in the parish of Woodford-cum-Membris, in Northamptonshire, and sell it in bulk or otherwise within or beyond the limits. Additional capital will be required.

Worksop Water.—Application will be made by the Worksop Water Company for authority to raise additional capital, and make and carry into effect contracts and agreements for the supply of water and its sale in bulk.

To the Secretary for Scotland, under the Private Legislation Procedure (Scotland) Act, 1899.

Coatbridge Gas.—The Coatbridge Gas Company will apply for authority to raise additional capital, and to reduce the illuminating power of their gas from 20 to 16 candles, or such other power as may be fixed by the Order.

Glasgow Corporation (Gas).—Application will be made by the Glasgow Corporation for authority to acquire the undertaking of the Milngavie Gas Company, carry it on, and supply gas in parts of the parishes of New Kilpatrick, Strathblane, and Baldernock, which are to form portions of the Corporation's supplementary district. The provisions of their Gas Acts of 1869 to 1901 are to be applied to the undertaking when acquired. The Corporation will also ask to be enabled to increase the amount they may borrow on bills.

Irvine Corporation.—The Corporation of Irvine will apply for authority to construct additional water-works, consisting of two reservoirs in the parish of Dalry, and various conduits, road diversions, &c. They will also seek to be relieved of the obligation to furnish a constant supply of water within their limits; and they will ask permission to adopt measures to prevent the fouling or contamination of their sources of supply. Further borrowing powers will be sought.

Nobel's Explosives Company, Limited (Ardeer Works) Water.—It is the intention of the Company to apply for power to construct works for the supply of their establishment at Ardeer with water. They will comprise a reservoir on the Glen Burn, a filter-tank, two conduits or pipe-lines, a road diversion, &c. In addition to supplying their own works, the Company will seek permission to sell to any local authorities, corporations, companies, or persons, in bulk or otherwise, any water which may not be needed for their own purposes. The usual powers granted to water companies will be asked for. The Company's funds are to be applied for the purposes of the undertaking, and addtional capital will be required.

To the Local Government Board for Ireland.

Ballymena Urban District Council Gas.—The Urban District Council of Ballymena will apply for authority to construct works, and manufacture and supply gas for lighting, heating, motive power, and other purposes within their district. Additional borrowing powers will be sought.

Strabane Gas.—Application will be made by the Strabane Urban District Council for power to manufacture and supply gas, construct new works and works connected therewith, and extend their limits of supply so as to include the town of Lifford, in the County of Donegal.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, Nov. 26.

(*Before Mr. Justice* FARWELL.)

Wigham Richardson and Co., Limited, v. Walker Urban Disrict Council —Walker Urban District Council v. Wigham Richardson and Co., Limited.

These actions arose out of the construction by Messrs. Wigham Richardson and Co., beneath the surface of Fisher Street, Walker, of a vault or tunnel, in which they had laid certain electric light wires for the purpose of their works, which are situated on both sides of the street; and it was alleged that they had done this without the Council's consent, and in contravention of section 26, sub-section 2, of the Public Health Act, 1875. The second action was taken first.

Mr. W. S. ROBSON, K.C., M.P., and Mr. R. J. PARKER appeared for the Council; Mr. CRIPPS, K.C., M.P., and Mr. MACMORRAN, K.C., represented Messrs. Wigham Richardson and Co.

Mr. ROBSON, in opening the case, said the Council were the Local Authority for the urban district of Walker; the defendants, Messrs. Wigham Richardson and Co., being manufacturers and engineers. The action was brought under section 26, sub-section 2, of the Public Health Act, 1875, which provided that any person who, without the consent in writing of the urban authority, caused any public building to be erected over any sewer of the authority, or caused any vault, arch, or cellar to be constructed under the carriageway of any street, should forfeit to the authority a penalty of £5, and 40s. for every day during the continuance of the erection, after notice for its discontinuance had been served. It further provided that the urban authority might cause any building, arch, or cellar so constructed to be pulled down, or otherwise deal with it as they thought fit. It was not in dispute that the arch or vault had been constructed; but the defendants denied that the plaintiffs were entitled to pull it down. The facts were these: The plaintiffs were not merely the urban, but also the electric lighting authority for Walker; and, of course, they directed the drainage, and had general control of the streets. In April last, it was reported to the plantiffs by their Surveyor (Mr. T. W. Laycock) that the defendants were then in the act of constructing, without the consent of the Council, a vault or tunnel under Fisher Street. The defendants' works were on both sides of the street, and they constructed the tunnel for the purposes of their works, and said they were entitled to do so. The plaintiffs were responsible for sewers which they might desire to make; and they did not wish to have a tunnel about 12 feet high put down from one end of the street to the other, which might interfere with their drains or electric lighting projects. The defendants persisted, notwithstanding the notice to discontinue, in constructing this subway; with the result that a subsidence of 15 inches occurred in the road, and a water-main began to spring at the joint owing to the disturbance of the soil, and the water leaked therefrom. Ultimately, the plaintiffs proceeded to cut a trench, in order to ascertain for themselves just what was taking place; and they came to the conclusion that the injury could not be remedied by mere surface repairs. The structure still remained, and hence the present action. This was the sole question at issue.

Mr. *Laycock* was called in support of the learned Counsel's opening statement.

Justice FARWELL said he failed to see what the parties were fighting about. It appeared to him that the issue was different from what the pleadings disclosed.

Mr. CRIPPS, for the defendants, said the real point between them was not what they were there for at all. It seemed to turn on the loss by the plaintiffs of the electric lighting of Messrs. Wigham Richardson and Co.'s works; the firm desiring to try another lighting service. He contended that all the District Council were entitled to do was to get rid of the arch, but not to remove the electric wires. Yet they had proposed to dig down and cut the wires; and this they had been restrained by interim injunction from doing.

Mr. *W. G. Law*, a surveyor, of Newcastle-on-Tyne, and Mr. *J. G. Spencer*, a civil engineer of the same city, having given evidence, his Lordship was addressed by Counsel.

Mr. *G. Graham Carr* was then called for the defence; and he described the construction of the arch.

Wednesday, Nov. 27.

On the resumption of the proceedings this morning,

Mr. CRIPPS argued the case for Messrs. Wigham Richardson and Co., and disposed of the part of the section of the Act relating to a "public building erected over a sewer" as a matter that did not arise here. As to the rest of the section—causing any vault, arch, or cellar to be built under the carriageway of the street—Counsel said here was a limitation of right, which an adjoining owner would have. Anyone who contravened the section would be liable to a penalty of £5, and 40s. for every day of the continuance of the breach. Further, the Act said that the urban authority might cause any such vault, arch, or cellar to be pulled down. There was undoubtedly an arch originally; but it was subsequently removed, and the space filled up. The question now was, whether what remained in the shape of the concrete foundation was a vault or archway, within the meaning of the section, which could be taken away. Counsel maintained that it was not. So far as the building had been in the nature of an arch, it had been destroyed. And the Council could not, under colour of calling it an arch, disturb the electric light mains of Messrs. Wigham Richardson and Co., which would mean depriving them of their electric power—a serious thing to them and their 3000 workmen. Therefore, on their behalf, he argued that the defendants were entitled, in their turn, to an injunction to protect those mains.

Mr. ROBSON submitted that the floor of the vault as it stood was part of the vault which came within the restrictions of the Act.

Justice FARWELL, in giving judgment, said it was simply and solely a question of fact as to whether the pipes were in a structure which the plaintiffs were entitled to remove. He had the two actions before him. The first was by the District Council, claiming a declaration that they were entitled, under section 26 of the Act of 1875, to exercise their rights—as to which there was no defence at all—then came the cross-action for an injunction to restrain the Council from interfering with certain wires. The Local Authority relied wholly and entirely on section 26. Messrs. Wigham Richardson and Co., being the owners of property on both sides of the street for a term of years, wanted to take their electric light cables from one side to the other. But it happened that the District Council were themselves authorized to supply, and did supply, electricity. Messrs. Wigham Richardson and Co. obtained their electric power from a rival Company. Mr. Robson had very properly, and very candidly, stated that the object of the action, so far as the Local Authority were concerned, was really to prevent the wires remaining under the road. Now to his (his Lordship's) mind, it was obvious that if Messrs. Wigham Richardson and Co. had drilled a hole through the earth, which an engineer had said might be done at this depth, and inserted an iron pipe, through which the wires could have been passed, there would have been no objection to it. It also seemed to him that if they had dug a trench and put it right again, the Local Authority would have been powerless to have the pipes removed. All that the defendants did to get access to the wires was to build a small tunnel, with a brick arched roof and sides and concrete floor. This was undoubtedly a vault, cellar, or archway under the carriageway, as provided for by the Act, and therefore required the written consent of the Local Authority to build. As this consent was not obtained, the plaintiffs had power to remove or alter the arch, or pull it down. Then Messrs. Wigham Richardson and Co. appeared to have changed their minds, and instead of letting the pipe remain in the interior of the tunnel, they proceeded to cut away the concrete flooring, leaving the concrete on either side to support the walls. The pipes then lay on the clay—or, at any rate, one or two of them. On the top of this the concrete was filled in to a certain height above the original floor. The Local Authority threatened to go and cut these wires, and justified their intention to do so on the ground that they were entitled to remove the vault, arch, or cellar, so far as the original arch did not remain. They further said they had power to remove the floor of it. In his opinion, the point on which Mr. Justice Buckley had already expressed an off-hand view—viz., whether the floor was or was not part of the vault—he was not concerned to consider. If the pipes were, as he held they were in fact, below the level of the concrete, the arch could be removed without interfering with the pipes, and what remained, in his judgment, formed no part of the vault or cellar as it stood at present. It was a wrong thing for the Local Authority to attempt to remove the concrete, not for the purpose of protecting the roadway, but for enabling them to get rid of certain electric lighting mains, which it would be a benefit to them to be rid of as a rival in trade. How far municipal bodies were entitled to enter into competition with private trading bodies, and to use the rights given to them for the purpose of protecting the public health in order to take away the customers of those private firms, was a serious question for consideration; but he said nothing further about this at present. He was not sorry to come to the conclusion that what was now complained of was no part of the arch or vault within the meaning of the section cited. The injunction granted by Mr. Justice Buckley, restraining the cutting of the wires by the plaintiffs, would continue. Judgment would be for the Council for a declaration following the words of the Act; and in the other action it would be in favour of the defendants—continuing Mr. Justice Buckley's order. With regard to the costs, he would suggest that the costs in the actions, having regard to the result, should be set off against each other, or that the parties should say nothing about them.

General Gas Company of France.—According to the report presented at the last annual meeting of this Company, who have ten stations in France and nine in Belgium, as well as shares in other gas undertakings, the revenue in the year ending June 30 amounted to 3,148,994 frs. (£125,960), compared with 3,134,036 frs. (£125,361) in the preceding twelve months. Adding the balance brought forward, 846,957 frs., made a total of 3,995,951 frs. to the credit of the profit and loss account. Deducting the general expenses, debenture interest, &c., there was left a sum of 1,496,240 frs. The Directors recommended that it should be disposed of as follows: Payment of 7 frs. 50 c. per share, 300,000 frs.; addition to contingent fund, 750,000 frs.; carried forward, 446,240 frs.. The dividend was fixed at 32 frs. 50 c. per share (500 frs.). The Company's statutory reserve now stands at 1,631,134 frs. (£65,245), and the contingent fund at 4,500,000 frs. (£180,000).

Gas-Engines and the Abatement of Smoke.—Dealing, in a recent issue, with the use of gas-engines in Sheffield, the "Ironmonger" said: "If the substitution of gas for steam power continues to progress at the same rate as during the last few years, the smoke problem in Sheffield will be largely solved in a comparatively short space of time, and without the aid of legislation. Signs are not wanting of a tendency to employ gas-engines of large powers for manufacturing purposes. A remarkable installation of gas-engines may be seen at the works of the Hardy Patent Pick Company, Limited, where steam power has been practically discarded. When the last engine of the order has been delivered, there will be at work two gas-engines of 120, one of 110, two of 70, one of 87, and one of 30 brake horse power—or a total of 607 brake horse power. These were supplied by Messrs. Crossley Bros., Limited, through their local agents. Gas-engines of considerable power are now to be seen at many of the local collieries, driving screening machinery, and at the iron-works. One large firm of manufacturers in Sheffield have found it profitable to substitute gas for steam power, notwithstanding the fact that the works were built only five years ago, and equipped with a specially-built steam-engine and boilers, a new chimney-stack being erected. The engine has been disposed of, the boilers are disused, and the chimney no longer emits any smoke; the plant being now driven by a gas-engine of 40 brake horse power. Among the latest Sheffield firms to adopt gas power is that of Hatfield and Boswell, who have put down a Crossley engine of 70 brake horse power.

MISCELLANEOUS NEWS.

INCANDESCENT GAS LIGHTING IN LONDON.

Extension in City Side Streets.

During the past twelve months, the Corporation of the City of London have been gradually substituting Kern-Welsbach burners for the old flat-flame burners prevalent in the side streets of the City; and at the meeting of the Common Council last Thursday, a quite unexpected debate took place on the question of gas *versus* electricity for street lighting. It was advantageous, inasmuch as it served as a test of the opinion of the members of the Corporation upon this all-important subject, which has not been debated in the City since 1891, when the late Commissioners of Sewers came to the agreement with the Laing, Wharton, and Down Company and the Brush Electric Light Company to light the main streets by electricity. The debate last Thursday, which resulted in a complete victory for incandescent gas lighting, arose out of the following three items submitted by the Streets Committee :—

1.—Relative to the want of additional lighting in Mansion House Place, College Hill, Fenchurch Avenue, New London Street, Brook Wharf Passage, Upper Thames Street, Duke's Head Passage, Queen's Buildings, Old Bailey, and Bride Court, New Bridge Street; and stating that they have given instructions for improving the lighting in the said thoroughfares by fixing new gas-lamps with incandescent burners, at an estimated cost of £95.

2.—Submitting for acceptance a tender of Messrs. Sugg and Co. for altering the five gas-lamps in Ludgate Circus, and lighting them by means of high-pressure gas, giving a light of 1000 candles per lamp, at an estimated cost of £162 (exclusive of the cost of reinstating any paving disturbed in connection with the work), and an annual charge for maintenance of £23 10s. 8d. per lamp.

3.—Relative to the want of additional lighting at Letts' Wharf; and submitting for acceptance a tender of the South Metropolitan Gas Company for lighting the wharf with gas-lamps fitted with incandescent burners, for the sum of £123 16s.

On the motion for adopting item No. 1,

Mr. Brooke-Hitching, who has manifested a keen interest in the electric light question in Marylebone, and who also took an important part in the recent debates at the meetings of the Common Council on the question of the electric lighting contracts, moved—"That the matter be referred back to the Streets Committee for further consideration." He said the lighting of the side streets of the City by means of Welsbach mantles was a retrograde movement. What was required was 32-candle power electric lamps which could be switched on at once, instead of incandescent gas-lamps, which had to be lighted by a man with a stick, in the same manner as was done forty years ago. It had been proved that the incandescent electric lamp was far superior to the flat-flame gas-burner; and with the experience before them of Edinburgh, Manchester, Liverpool, and Brighton, showing what could be done in the way of electric lighting, he should move that the three items be referred back. He would ask the Chairman of the Streets Committee (Mr. Painter) to agree to take them back *en bloc*.

The Town Clerk (Sir John Monckton) informed the honourable member that the items would have to be disposed of separately, as they were for different objects.

Mr. Brooke-Hitching then moved that the first item be referred back.

Mr. J. H. Lile seconded the motion, and said the proper thing to do was to put up more electric lamps.

Mr. M'Carthy said the question of lighting the side streets with incandescent electric lamps had been tried with the City of London Electric Light Company some years ago, and had resulted in failure. The glow lamp gave no better light than the old-fashioned flat-flame gas-burner; and the Company had refused to provide a "modified form of arc lamp" for the side streets at a reasonable cost.

Mr. A. C. Morton called the attention of the Council to the exceedingly bad state of the lighting of the side streets of the City, and said that during the past twelve months a great improvement had been made in the street lighting by the fixing of incandescent gas-lamps. If members would only look at some of the central parts of London, they would see what incandescent gas lighting was doing to brighten up the streets, especially where the high-pressure system was in use; while, owing to the great liberality of the South Metropolitan Gas Company, the whole of South London had adopted that lighting at hardly any increase in cost. In the City they could have in the side streets the ordinary incandescent gas-burner, which had about five times the illuminating value of the old one, at an increased cost of only about 1s. per lamp per annum. It was the opinion of many that, though the electric light was a great success in private houses, for public lighting it was a failure, as could be seen in the City of London.

Mr. Morris (Chairman of the Bridge House Estates Committee) bore testimony to the improvement in the lighting of the City bridges since incandescent gas-lamps had been placed on them. He stated that only that morning he had received a letter from the Chairman of the Lighting Committee of the Liverpool Corporation stating that the streets could not be economically lighted by electricity.

Mr. White said the light they were now getting from the incandescent gas-lamps was very satisfactory indeed. He expressed the opinion that there was no finality with regard to this system of lighting; and he said he should like to invite the members of the Council to view the new incandescent lamps in St. Swithin's Lane. They were far superior to anything in the way of street lighting he had yet seen, and were all that could be desired. He heartily endorsed the report of the Streets Committee.

On the amendment being put,

The Lord Mayor (Sir Joseph Dimsdale) declared it to be lost—only two or three members out of a full court voting for it.

The motion relating to the first item was then put, and was carried practically unanimously. On the second item being put to the vote,

Mr. Brooke-Hitching moved, as an amendment, that the item be referred back to the Streets Committee, for the additional reason that Ludgate Circus was not a side street, but a main thoroughfare lighted by electric lamps. He stated that high-pressure incandescent gas-lamps had been tried in Marylebone, and had been found to be a failure. The lamps had to be removed and electric light substituted.

Mr. Lile seconded the amendment, and said the proper thing to do would be to increase the number of arc lamps in the Circus.

Mr. Morton strongly supported the item, as it would afford an opportunity for the system of high-pressure gas lighting to be tried in a prominent position, where all the members of the Council would be able to view it. The effect of placing these high-pressure lamps round the Circus would be to assist the electric arc lamps, which were disgraceful in the City. If any arguments were wanted in favour of the high-pressure system of gas lighting, let the members view the three City bridges—Blackfriars, Southwark, and the Tower—all of which had been lighted by this system. He would particularly refer them to the Tower Bridge, which he would call a "picture of lighting." The Bridge House Committee had only lately inspected this lighting on their bridges, and they were very satisfied with it.

Mr. Morris corroborated all Mr. Morton had said with regard to the bridges.

Mr. Painter confirmed Mr. Morton's statement, and said he had it in his mind to call a meeting of the Streets Committee shortly to view this bridge lighting.

A Member remarked that the high-pressure gas-lamps recently erected in the neighbourhood of Charing Cross completely put the electric arc lamps "in the shade."

The amendment having been lost, the motion was put and carried, and the matter was referred back to the Committee for execution.

With regard to the third item,

Mr. Brooke-Hitching remarked that the waste heat from the refuse in the dust destructor should be employed to generate electricity to light the wharf; and he expressed the hope that the item would go back to the Streets Committee for the consideration of this question.

Mr. J. Harris supported this suggestion, and referred to what had been done in Whitechapel and Shoreditch in the matter of utilizing the waste heat from the destructor in the lighting of the Borough Councils' thoroughfares.

The suggestion, however, did not receive support; and the offer of the South Metropolitan Company was accepted practically unanimously. Thus all the three items were passed; and the fact showed a great advance in opinion on the subject of street lighting during the past eleven or twelve years.

DEVONPORT GAS-WORKS PURCHASE.

The Devonport Town Council had before them on Thursday a report of the Gas Committee which dealt, among other matters, with the question of the transfer of the undertaking to the Corporation. The arbitration proceedings are to begin at the Surveyors' Institution on the 9th inst. Mr. Thomas Newbigging is to be the Arbitrator for the Corporation, and Mr. Corbet Woodall for the Company. The Umpire is Mr. James Mansergh. We learn that Mr. Charles Hunt was asked to act as one of the valuers for the Corporation, but he could not be away from Birmingham at the time of the arbitration; and the Corporation were also unable to obtain the services of Mr. Balfour Browne, K.C., as their leading Counsel. It is anticipated that the transfer of the undertaking will take place at the end of the present year. Another matter which is engaging attention is that of the inadequate supply of gas. The Manager of the works (Mr. S. E. Stevenson) has advised the Committee to take the necessary steps for remedying certain defects in the retort-house. The Town Clerk (Mr. A. B. Pilling) reported that Messrs. Stevenson and Burstal had advised the immediate undertaking of some important reconstructions. The Committee decided to hold a special meeting for the purpose of inspecting the works and considering the question of the necessary improvements.

THE NEW GAS-WORKS FOR HASTINGS.

We learn from a local paper that during the past few months considerable progress has been made with the new works which are being erected by the Hastings and St. Leonards Gas Company at Glyne Gap. They will be built in four sections, and the first retort-house is well advanced. The others will be erected as the demands of the business require. The cost of transferring such extensive works is necessarily very great; but when they are in operation, a great amount of manual work will be done away with, as machine stoking will be employed. The conditions under which the men will work will be vastly improved, as adjoining the retort-house will be spacious lobbies for them to rest in. There will be about a mile of sidings, the property of the Company, running directly into the works; and already some progress has been made with them. A big retaining wall has been built; and in this, as in all the other portions of the works, thoroughness and stability are evident. The coal will be taken in trucks straight to the retorts, while for storage purposes a special hydraulic tip will be used, and the trucks emptied at one operation into the coal-store, instead of the coal being unloaded with shovels and carted. Manufacturing operations will be conducted on the most approved principles; while the situation of the works—midway between Hastings and Bexhill—will preclude the possibility of nuisance being caused to either town. The plans have been prepared, and the quantities taken out, by Mr. C. F. Botley, Assoc.M. Inst.C.E., under the supervision of his father, Mr. C. E. Botley, M.Inst.C.E., the Company's Engineer and Manager; and the work up to the present time has all been done by the Company's employees—no contractor having been engaged.

A special meeting of the Shifnal Rural District Council has been held to consider the Wolverhampton Corporation Water Bill. Resolutions were passed expressing the opinion that the proposed Bill will be prejudicial to the interests of the ratepayers and inhabitants of the district; and the Council decided to petition against it.

SUBWAYS IN LONDON STREETS.

The Proposals of the County Council.

As mentioned in our Editorial columns last Tuesday, the London County Council have given notice of their intention to promote a Bill to enable them to construct a tramways-subway under Southampton Row and the new street from Holborn to the Strand and the Victoria Embankment, and to apply thereto all or some of the provisions of their Subways Act of 1893, and to confer powers on them for requiring gas, water, electric light, and other companies to move into this subway any pipes or wires in any of the thoroughfares which will be affected under the Bill. In connection with this application, the Council will ask for further powers in regard to subways. They will ask Parliament to vest in the Council the subsoil under streets for the purpose of the construction and use of subways and underground tramways, and to enable them to make and maintain subways of such form, dimensions, and material, and in such streets within the County of London, as they may from time to time think fit. Provision will be made for the use of such subways for the reception of sewers and drains; and the Council will ask for power to require the laying of sewers and drains in, and their removal into, such subways. Authority will be sought for the Council to "require the several Companies supplying gas, water, and electrical energy in the County of London, and other companies, local authorities, bodies, and persons having power to interfere with streets in that County, to make use of such subways for the reception of mains, pipes, and wires hereafter laid or placed by them, and to require such companies, bodies, and persons, on such terms and conditions as may be prescribed in the Bill, to move into such subways all mains, pipes, and wires already laid or placed by them in any of such streets." The Council wish to be empowered "to make charges in respect of the use of such subways."

The various provisions in connection with the subway and tramway above referred to shall, so far as they are applicable, apply in the case of any other subway or tramway to be constructed by the Council under the powers of the Bill to be promoted, which will authorize the making or provide for the confirmation of any agreement between the Council and the Councils for the Metropolitan Boroughs, or any or either of them, with reference to any matters in which they are respectively interested.

GLASGOW GAS AND WATER SUPPLY.

Corporation Lectures.

Last Saturday week, lectures were delivered in different parts of Glasgow, by three of the principal officials of the Corporation, on the gas and water supply and the cleansing of the city. We give below some particulars from Mr. A. Wilson's lecture on gas affairs, and from that of Mr. R. Wilson on the water-works.

Gas Department.

Mr. A. Wilson, the Manager of the Dawsholm Gas-Works, said that up to 1869 the gas supply was in the hands of two Companies; but in that year the undertakings were acquired by the Corporation. The great increase in the industry since then would be apparent when it was stated that in 1870 the yearly make was 1295 million cubic feet, whereas last year it was 6121 million feet. During this period, the gross revenue had risen from £235,700 to £870,000. To meet the increasing demands, new works were being erected at Provan, which, when completed, would cover an area of 131 acres. There would be four distinct sections, each capable of producing 12 million cubic feet per day. Mr. Wilson said that gas, although one of the most useful necessaries of modern life, and supplied at a low cost, was consumed and paid for generally in anything but a thankful spirit. Most people had the idea that payment of gas bills was on the same level with payment of taxes. This idea seemed to have got crystallized into the mind of the public, and no doubt accounted in a large measure for the indifferent treatment which gas often received. If gas had to be bought at a shop, like any other household commodity, and carried home for consumption, and a fresh supply procured as soon as the stock ran low, what a different value would be put upon it. If gas consumers would only bring the same amount of common sense to bear on the use of gas, by trying to get full value out of it, as they did with other commodities, they would save money and have much better lighting. Referring to public lighting, the lecturer said great advances had been made, but that little evidence of this was forthcoming as yet in Scotland. Glasgow, one of the most advanced cities in many respects, was far behind in the matter of street lighting. One of the engineers at the recent Engineering Congress said that the lighting of Glasgow streets was deplorable, and described the means employed as "a lot of rush-lights and flickering blue-bottles." Many cities in England, and especially abroad, were taking full advantage of the improved methods of street lighting; but the authorities in Glasgow seemed content with some experiments in a few streets, using in most cases old, out-of-date lanterns, which were quite unsuitable for the modern system of lighting. On the Continent, with gas of from 8 to 12 candle power, the streets in the largest towns were brilliantly lighted by the incandescent gas system. In one district alone in the south of London, over 17,000 out of a total of 22,000 lamps, had been altered within three years from flat-flame to incandescent lighting, almost invariably with properly-constructed lanterns, as it was found that a great deal of light was wasted by the old style of lantern. High-power lighting, similar to that used for the Exhibition grounds, had been adopted for many of the principal thoroughfares, crossings, and bridges, and was giving much satisfaction; the places specially mentioned in this connection being Liverpool, Sheffield, and Newcastle. During the lecture, over one hundred slides were thrown on the screen; and many exhibits were shown of incandescent burners suitable for the home, the hall, and the street.

Water Department.

Mr. R. Wilson, the Treasurer to the Water Department, traced the gradual growth of the works, and the means adopted to supply the best possible water, after which he referred to the great opposition and expense incurred before the Loch Katrine water was introduced in the year 1859. Her late Majesty Queen Victoria performed the opening ceremony on Oct. 14, 1859; and, in March, 1860, the new supply was general over the whole city, and the engines at Dalmarnock were stopped. The lecturer then took his audience (by the aid of limelight views) to visit the Gorbals works and the Loch Katrine works, showing the various lochs from which the water is obtained, the sluices at Loch Katrine, the old and new aqueducts, aqueduct bridges, reservoirs, &c. The total length of the new aqueduct was 23½ miles; and the cost of the tunnel through the rocks was from £27,000 to £30,000 per mile. The first aqueduct opened in 1859 was 8 feet wide and 8 feet high; the second, opened in June last by the Lord Provost, was 12 feet wide and 9 feet high. Both aqueducts combined would be capable of conveying 110 million gallons of water per day. If Loch Katrine and Loch Arklet were not able to supply this quantity, then additional water could be brought into Loch Katrine from the adjoining valley of Loch Voil and Loch Doine. The total cost of the works to date was £3,907,578, of which about £1,300,000 had been spent on the new reservoir and aqueduct works. The debt was being paid off by sinking funds; and £1,075,628 had been wiped out since 1870. The population served at present was 1,057,833; and the average quantity of water supplied last year was 56,345,000 gallons per day, equal to 53¼ gallons per head.

THE CEMENT TRADE AND THE PRICE OF COKE.

At the Second Ordinary Meeting of the Associated Portland Cement Manufacturers (1900), Limited, held at the Cannon Street Hotel last Wednesday, under the presidency of Mr. F. A. White, the unsatisfactory nature of the results of the past year's working called forth some explanatory remarks from the Chairman. He said the accounts presented were a record of some hopes unfulfilled, and they had caused the Board great disappointment. One of the reasons for this was the price of fuel. At the time of the formation of the Association, the Board were looking forward to a lower price for coke, which they purchased chiefly from the London Gas Companies. These powerful Corporations, to the consternation of the Directors, fixed their price for the year 1900-1 at the altogether unheard-of figure of 22s. per ton. The Companies must be supposed to be the best judges of their policy, but he could not help feeling that, in using to the utmost the power which they happened to possess at a particular juncture, they overdid it; and that, in closing their ears to the protests made on behalf of the Company, they hardly gave due consideration to the part that coke prices played in enabling their largest customers—the cement manufacturers—to hold their own in all the markets of the world. It was only fair, however, to add that one of the two great Gas Companies did, in January last, listen to the Board when they asked for some reduction, on the ground that the price of 22s. per ton handicapped the cement trade of this country. Had it been possible to purchase coke even at the comparatively high prices of the year on which they had now entered, there would have been a difference in the money paid for that important item of cost of about £250,000. It might be said that surely their combination was in a position to deal with this set of circumstances, and to recoup from buyers the extra cost of manufacture. That was true in theory; and the Board had no choice but to raise prices for the time being. It soon became apparent that these higher rates would produce, as they had since done, an onslaught by foreign competitors on the Company's markets at home and abroad. Temptations were held out to their customers all over the country, and although a number of them had continued to give the English trade their orders, the foreign competition had made more headway than the Directors had thought possible. The Board were strongly tempted to fight the foreigner, and drive him out of the market by prices that would have made his trade impossible; but they came to the conclusion that during a state of transition, and with extraordinarily dear fuel, the Company would enter on a life-and-death struggle at singular disadvantage. It might therefore be said that they met the matter half way. They resolved to be content with a very moderate profit for the time being, and to put up with some reduction of output, at the cost of an increase in the sale of foreign cement at a time—which he hoped was a very exceptional one—when it answered the purpose of the Continent to sell without profit. This explained how it came to pass that the Company's output for the year ended June 30 last was considerably below the capacity of their works, and that their average selling price was less than that of 1899.

SALES OF STOCKS AND SHARES.

In accordance with the announcement which had previously appeared in our columns, Mr. Alfred Richards carried out, at the Mart, Tokenhouse Yard, E.C., on Monday last week, the instructions of the Directors of various gas and water undertakings to offer for public competition new issues of stock of their respective companies. First in importance was an issue of £10,000 of 4½ per cent. preference stock of the Swanage Gas and Water Company, which owes its existence to the late Mr. George Burt. The water-works were established in 1864, and the gas-works in 1880; and they were carried on by Mr. Burt, and since his death by his Trustees, down to the date of the passing of the Act of last session. Under that Act, the Company are authorized to raise £50,880 of new capital—£22,280 for gas, and £28,600 for water purposes. The £10,000 offered yesterday week was part of this new capital; and it was equally divided between the two branches of the undertaking. The accounts of the Company for the past sixteen years have been investigated by Messrs. Lass, Wood, and Drew, who find that steady progress has been made in the earnings, and that during

the last three years the profits have averaged about 5 per cent. on the original capital of £30,720. The new preference stock will rank for dividend before the whole of this amount, and the holder will be entitled to that which accrues from the 31st inst. With these preliminary remarks, we will see how this new-comer to the Mart was received there. The first lots put up each consisted of £100 of the "water" stock; and they were placed at from £102 to £103 10s.—an average of £102 12s. 9d.—each. The "gas" stock was next submitted, and fetched an average of £100 1s. 9d. The yield to the investor in the former stock is £4 7s. 8d., and to the purchaser of the latter £4 9s. 11d. per cent. The new issues by the Lea Bridge Gas Company consisted of £8000 of consolidated ordinary stock (last dividend 5 per cent.), which was sold at an average of £106 8s. 1d. per £100 of stock, returning the buyer £4 14s. per cent.; and £2560 of 4 per cent. perpetual debenture stock, which fetched an average of £101, yielding £3 19s. 3d. per cent. The Southend Gas Company offered £5000 of their new ordinary 5 per cent. stock, the last dividend on which was at the rate of 5½ per cent. per annum. The portion which was not bought in realized, on an average, £107 0s. 10d. per £100, yielding £5 2s. 10d. per cent. A new issue of 4 per cent. perpetual debenture stock of the Aldershot Gas and Water Company was disposed of at prices ranging from £100 5s. to £102, or an average of £101 6s. 6d. per cent.; returning the purchaser £3 18s. 11d. on his investment. Altogether, Mr. Richards sold about £30,000 of stock.

Among other recent sales, the following may be noticed: Messrs. J. S. Howell and Co. sold at Southsea some original shares in the Portsmouth Water Company for £28 each, some of the 1868 series for £13 and £13 2s. 6d. each, and some of the 1883 series for £8 17s. 6d. apiece—all *ex div.* At the same sale some ordinary shares in the Woking Water and Gas Company fetched £9 10s. each. Messrs. Waters and Rawlence sold in Salisbury six original ordinary 10 per cent. shares, of the nominal value of £12 10s. each, in the Salisbury Gas Company, for £24 12s. 6d. and £24 17s. 6d. apiece; and six 5 per cent. preference shares of similar value for £14 each. At the same sale, £40 of 3½ per cent. debenture stock of the Fisherton Anger and Bemerton Water Company was sold at par. Messrs. Hollis and Webb recently sold 50 £5 10 per cent. shares in the Drighlington and Gildersome Gas Company at £10 10s. per share. The Staffordshire Potteries Water-Works Company having decided, in pursuance of their Act of 1888, to issue so much 3½ per cent. perpetual debenture stock as would raise the sum of £4380, this stock was offered for sale by Mr. S. Edwards. The stock was put up in lots of £100; the first three realizing £111 each, the next two £110 each, and the remainder varying from £109 to £107. The total of 40½ lots produced the sum of £4370 10s. Mr. J. P. Chapman sold, on Wednesday last, some £25 original shares in the Lewes Water Company, at prices ranging from £82 to £83 10s. each; while some £25 shares issued in 1869 realized from £54 to £57 10s. each. A £25 share issued in 1883 fetched £57 10s.; and a share of similar amount issued in 1891 was knocked down at £71. £40 of preference stock was sold for £61. The last dividends were at the rate of 10 per cent on the original and 1891 shares, 7 per cent. on the 1869 and 1883 shares, 5 per cent. on the preference stock, and a further bonus of 15s. per share was paid to holders of original shares. Some original stock in the Lewes Gas Company was also sold at prices ranging from £172 to £178 per £100 of stock. In accordance with the announcement which appeared in our columns, Messrs. George Nichols, Howes, Young, Alder, and Co. sold by auction on Thursday £25,000 of 5 per cent. stock and £8000 of 4 per cent. debenture stock of the Bristol Gas Company. Mr. George Nichols conducted the sale, and reminded those present that the middle market price of the ordinary stock was 119½. The reserve of the ordinary stock was £116. The highest price realized was £117 5s.; the lowest, £116. Only a few lots were unsold. All the debentures were readily disposed of at £105 5s. to £105—the reserve.

Messrs. Catling and Son recently sold by auction in Cambridge 300 £10 shares in the City of Ely Gas Company; being the first portion of the additional capital, entitled to a maximum dividend of 7 per cent. The present rate payable will be £5 12s. per cent. free of income-tax. The prices realized were from £59 to £63 per £50 lot. The total amount obtained by the sale was £3599; and the yield to the investor is, on the average, £4 13s. 4d. per cent.

GAS SUPPLY OF BORDEAUX.

Competition for the Concession.

Taking their cue possibly from the capital, the worthy citizens of Bordeaux—or, more properly speaking, their representatives in the Municipal Council—have lately been much exercised on the subject of the gas supply of the city. The concession of the Gas Company will expire in 1904, and the question arose as to what was to be done then. The Company were in position, and thoroughly competent to keep up the supply. Moreover, they were necessarily able to offer the Municipality very advantageous terms. But in Bordeaux, as elsewhere, there are those who have caught the municipalization fever; and they accordingly strongly advocated the "running" of the gas-works by the city. The proposal was warmly supported by those who regard Municipalism as a means not only of realizing Socialistic ideals, but of obtaining personal influence—in other words, of pushing themselves to the front. The member of the Council who reported upon the subject favoured the system, and laid stress upon the pecuniary advantages which would accrue to the city by its adoption, as had, he said, been the case in other towns in France and abroad. Unfortunately, as far as that country is concerned, the examples of municipal management do not justify his ardent advocacy. However, it had no effect, for the Council decided to have nothing to do with the direct management of the gas supply, but to throw it open to competition. Probably they thought people competent to undertake the work had a number of schemes all ready pigeon-holed for use at a day's notice, for each competitor was allowed to send in several projects if he thought fit, and they were all to be delivered by last Saturday. The concession is to be for a supply of gas for lighting and motive power for a period of thirty years from July 1, 1904; but the holder will be allowed also to supply electricity. He will have to pay the Municipality a fixed annual rent for the works and installations placed at his disposal by them, provide for the employees' pension fund, and set aside 10 per cent. of the net profits for the officers whose annual salaries do not exceed 4000 frs. He will have the use, as from the above-named date, of the existing buildings, plant, and mains, with the exception of certain works specified, at an annual rent of 400,000 frs.; and he will have to construct, at his own expense, entirely new works, which, at the expiration of the concession, will become the property of the city, together with whatever extensions may have been made in the old ones or in the distributing system. The prices fixed for gas are 18 c. per cubic metre to private consumers, 15 c. for motive power, and 7 c. to the Municipality. These figures are based on the price of 24 frs. per ton of Newcastle coal delivered on the works; and for every drop of 4 frs. the charge for gas is to be reduced by 1 c. But no proportionate increase will be allowed in the event of the price of coal going up. The concessionaire is to allow the staff to participate in the profits to the extent of 10 per cent. Before taking part in the adjudication, he is to deposit in the Municipal Treasury caution-money to the amount of 500,000 frs.; and within three months from the date of the adjudication he is to pay 5,000,000 frs., of which 4,800,000 frs. will be returned to him when the new works have been started.

ELECTRIC LIGHTING NOTES.

In the "Notes" in the "JOURNAL" for the 12th ult., reference was made to the crusade which is being carried on by Mr. Joseph Store against the electric lighting scheme of the Louth Corporation. The particulars he put before the ratepayers in the little pamphlet then noticed (not the least significant of which was the list of towns in which the gas and electric light works are in the hands of the local authorities, yet where the street lighting is done by gas, and that of towns owning electricity plant, yet buying the local companies' gas for street lighting) have not, as yet, made much impression—at all events, not upon their representatives in the Town Council; for, at a special meeting of that body on the 21st ult., a resolution was passed to apply to the Board of Trade for a Provisional Order, and the notice has been duly given. When we say "their representatives," we mean those who were in attendance; for it appears that this matter had been precipitated by the votes of 13 out of 24 members of the Council—some of those most trusted being absent, and others not voting. The matter will, however, have to come before the ratepayers for their sanction; and, in view of this fact, Mr. Store has added to his pamphlet another letter directing attention to the hazardous nature of the step about to be taken. He points out first that £150 of the ratepayers' money is now in process of dispersion in initial expenses; and he next expresses the belief that the suggestion that £10,000 will provide a satisfactory installation of plant for the supply of electricity for a town like Louth should not be accepted without question. Supposing the undertaking should cause an increase in the rates, the burden would fall heavily upon the Gas Company, owing to their large assessment, and this would be felt by the consumers, especially those outside the area of compulsory supply, who would have to bear a double burden. If the Town Council are desirous of improving the public lighting of the town, there are means of doing so without introducing electricity, and causing disturbance of the streets thereby, and, moreover, without entailing the expense attending the installation and maintenance of the proposed system. Mr. Store, as a burgess and ratepayer, appeals to the Town Council not to proceed at present with their application for the Order. We do not suppose his protest will have any effect. It will be for the ratepayers to make their voices heard when they are asked to endorse the resolution of the Council. This they will do if Mr. Store can influence them.

The Bristol Town Council discussed last Tuesday various matters connected with their electric light undertaking, on a report presented by the Electrical Committee. It was recommended therein that the Corporation should apply to Parliament for power to extend the limits for the supply of electric energy for all purposes outside the city; for leave to charge special rates to persons having an independent supply; and for power to provide electric appliances and wire premises, &c. Alderman Pearson explained that as a Bill was being promoted for other purposes, the Committee had thought that it would be convenient and cheap to get these powers by the same Bill. There had been applications from outside the city for the current; and as the districts grew, other applications would come. But there would be no attempt to force the supply upon them. The Committee thought, too, that the time had come to make it clear that it was not right for a person to instal a single electrical plant and work it, and then call upon the Corporation to have a duplicate plant ready to take his load whenever he thought fit. Other authorities had obtained, or were asking for, powers to deal with this question. He had no desire to see the Committee encumbering themselves with wiring. Free wiring was impossible to an ordinary tradesman; it meant thousands of pounds' worth of material staying for years upon premises with the risk of the tenants using it. But wiring upon the deferred payment system was practicable, and in that the Committee might co-operate. The Committee were prepared to let motors on hire, and sought legal authority to do so. They also wanted their sinking fund suspended for two years from the date of the loan, or until the works were in beneficial use—a very common power. He moved the adoption of the report. Mr. Hughes formally seconded the motion. Mr. Saise said what concerned the outside areas was when they were likely to get any advantage from the extension. While Bristol had oil-lamps in the streets, he thought the Committee might be content with the city area. If, however, the extensions were made, the outside districts should be promised some definite advantage. Mr. Levy also suggested that the Committee expend their energies in doing something more for Bristol, rather than in going outside. He said he had great faith in electricity, but not sufficient to induce him to refuse gas as a stand-by. Mr. Tryon moved an amendment to prevent the letting on hire of any apparatus except motors. After some discussion, however, it was defeated, and the report approved.

RATING OF THE EAST LONDON WATER COMPANY.

Valuation Appeal.

Tuesday, Nov. 19 (*Continued*).

After the close of the appellants' case, as reported last week,

Mr. MARSHALL opened the case for the respondents. He said the general question as to the position of the Company was a comparatively simple one. It was a Company which had been fairly fortunate, and had made progress for a number of years, both in its gross and net receipts. In 1894, the gross receipts of the Company were £289,731, and the expenditure £121,703; showing a net receipt at that time of £168,028. In 1900—only six years afterwards—the gross receipts had increased to £369,498; the expenditure was £164,259; and the net receipts £205,239. In other words, there had been a growth in profit within these six years of over £30,000. That was a substantial increase in the net earnings, which would justify a fairly substantial increase in the rating of the Company in the various parishes. Taking Hackney, the parish he represented, as an instance, in 1890 the rateable value of the Company in the parish stood in the valuation list at £13,000; in 1895, it had been increased to £15,223; and in 1900 the figure was increased by the Overseers to £16,745. But on objection being made before the Assessment Committee, the amount had been first reduced to £15,197, and afterwards to £14,937. So that the figure in respect of which the appeal was brought in 1900 was some £300 less than it was in 1895; while during that period the net receipts of the Company had grown by some £37,000. When it was suggested that there had been unreasonable increases, that was not true—certainly in the parish of Hackney. In some of the parishes there might have been slight increases; but they were only slight, and not so much as were warranted by the rapid progress of the Company. In Mile End, there had been no increase for fifteen years; and it was somewhat of a rash undertaking for the Company to endeavour to say that the valuation ought to be less than at that time. The learned Counsel then proceeded to analyze the schedules laid before them by Mr. William Marshall. As to the gross receipts, there were only two items which they had corrected; and these had been agreed at £364,525. Regarding expenditure, the differences were not very considerable. They had deducted 10 per cent. of the salaries of the engineering and clerical staff, because part of their work was admittedly done for the landlord. The one other item in dispute between them was the increased payment to be made to the Conservators of the River Lea under the Act of 1900, £2067. The argument of the Company was that, although not payable in the account year, any incoming tenant would take into consideration this increased price in fixing the rent he would be willing to pay. On the other hand, it was equally certain that the amounts receivable by the Company in the various parishes under the new valuation list would be considerably larger than they had been during the last five years. Therefore, if the incoming tenant was to look at the additional payment he would have to make, he would also have to consider the enlarged receipts he would be entitled to get. The most important item in Mr. Marshall's accounts was that of the capital required by the tenant to meet the outgoings of the concern. Mr. Marshall fixed this at £92,338, in addition to a bank balance of £12,000. This, they ventured to think, was far too large a sum. Mr. Marshall, besides providing for wages and materials (which had to be met week by week) and for the rates, said beyond that, the hypothetical tenant would have to provide a sum for the hypothetical rent which he hypothetically would have to pay, and in this imaginary scheme assumed that the tenant would have to pay his rent half yearly. Beyond that, he claimed that the tenant was entitled to draw his profits as he went on. The whole suggestion was as startling as it was new. He went through, in great detail, the accounts of the receipts and outgoings during the different months; and concluded that a sum of £20,000 and no more should be allowed for the capital of the tenant. Counsel then examined the figures given for the renewal and repairs of mains, and for the meters. On this they came to the important question of which were tenant's meters and which were landlord's; and he quoted the judgment in the case of *Reg. v. Lee*. Proceeding, he criticized several other items in the accounts, and the value of the unproductive parts of the property and the annual sinking fund for reproduction. This sinking fund was put down as 1 per cent. on £2,250,000, the present structural value of the works, the value of the pumping, carrying, service mains, and the estimated cost to renew the paving over the mains, which came to nearly £250,000. This was a new feature in rating valuations, and would require very careful consideration. The sum of 1 per cent. would represent a life of 46 years all round; and if the life of a main was as represented (60 or 70 years), much less than 1 per cent. would be the proper figure. There remained the principal item in the valuation—the value of the indirectly productive property. It was sought to put up the value of this property very largely, in order to diminish *pro tanto* the value of the directly productive property; and on this point he asked the Arbitrator's careful consideration and revision.

Mr. ENGLISH HARRISON followed on the same side. He quoted several authorities to prove that the rent of a yearly tenant was payable only once a year, unless there was a stipulation to the contrary. He contended that the Arbitrator was not entitled to introduce into the terms of an assumed tenancy anything except what the statute defined. Counsel, in great detail, criticized the item of £198,000 for tenant's capital, provided by Mr. W. Marshall, contending that the amount of tenant's capital required had been grossly exaggerated, and that he had based and founded his calculations upon a complete misapprehension of what was the law. The learned Counsel had not concluded his argument when

Mr. *Bryan* arrived, and, recalled by Mr. MARSHALL, said the £62,000 for meters did not include the Deacon meters, which were charged to the main-pipes account. He had not the prices of the various meters; for he found that, since 1855 to now, there had been a variation of over 200 per cent. in the same size meters. There were 6815 meters in use in June, 1900, and 6732 in December, 1899; the commonest size being ¾ inch. He had had the length of the different adits taken out. They were: Waltham Abbey, 515 feet with eight boreholes; Chingford, 1005 feet with five boreholes; Copper Mills and Ferry Lane, 6474 feet with 25 boreholes and eight air-shafts; Lea Bridge (No. 1), 6934 feet with six boreholes and sixteen air-shafts; Lea Bridge (No. 2), 3549 feet with two boreholes and six air-shafts; and East Ham, 2511 feet with seven boreholes and two air shafts.

Wednesday, Nov. 20.

Mr. *Bryan* was again recalled, and examined as to their margin of pumping power in the engines. He said they had not too much, allowing for contingencies and emergencies. In every case they had a spare engine to take the place of the other working if required.

The ARBITRATOR: You say you could not reasonably carry on your business with any reduction in the horse power of your engines?

Witness: We could not.

Mr. ENGLISH HARRISON then continued his address. He submitted that the renewal fund was largely in excess of what was required, and that a great number of renewals had been included under the head of repairs, and paid for out of revenue.

Mr. SINCLAIR COX (for the Woolwich Union) said that, unless the necessity should arise, he did not propose to give any evidence.

Mr. *Restler*, Engineer of the Southwark and Vauxhall Water Company, examined by Mr. BALFOUR BROWNE, produced the plans and specifications of the new filter-beds at Hampton. They were to cost £60,500, without ironwork. In the report of the Landaff Commission, it was stated that the Southwark and Vauxhall Water Company had considered that their 5 acres of filter-beds could be constructed for £30,000. That was because they were constructed on old reservoirs; but they found out they were more expensive than new ones, and really cost £90,000.

Mr. *Alfred Nickerson* said he had valued the furniture at the Company's offices at £1700. That was a fair and reasonable price.

Evidence was then called on behalf of the respondents.

Mr. *William Eve*, examined by Mr. RYDE, said he had made a valuation of the whole undertaking. The initial figure he had taken was that of the receipts as at June, 1900, which he made £354,902. He had not included the transfer fees; but had added the amount received for water supplied to the Southwark and Vauxhall Company. His next table comprised the expenses according to the Company's accounts, and the way in which he dealt with the figures, amounting to £197,688. He had allowed the first four items of the expenses; but had deducted £780, which was 5 per cent. on £15,598, the salaries of the Engineer and staff. That was his estimate of what had been done by them in developing and improving the landlord's estate; and anyone who knew the history of the East London Company for the last four years, would know what an immense amount of time Mr. Bryan and his staff had necessarily spent in defending the interests of the landlord in Parliament and elsewhere. The abstraction of water from the Thames and Lea he made the same as Mr. Marshall; but he only took the amount paid in the account year, and not the sum of £2067 for the extra cost of the water from the River Lea. If the hypothetical tenant looked forward to the new disadvantages he would have to meet, he should consider also the advantages gained from the quinquennial assessment, which had greatly raised the rateable value of various properties.

The ARBITRATOR suggested that any evidence on this point should be reserved, as his present inclination was not to preclude the Local Authorities from making a supplementary valuation list in case it should be necessary.

Witness, proceeding, put in a number of tables; the details being extracted from the Company's books by Messrs. Hart, and the allocation made by him. He had charged the whole of the repairs to the hereditament to the landlord, because it was the duty of the landlord to maintain the hereditament in a state to command the rent. He then went through the various figures relating to the pumping charges, the Engineer's disbursements, and the establishment and law charges.

Friday, Nov. 29.

Mr. *Eve* was re-called, and further examined by Mr. RYDE with regard to his valuation, which was as follows:—

Receipts.

Water-rate accrued, half year to Dec. 31, 1899 . . .		£190,745
,, ,, ,, ,, ,, June 30, 1900 . . .		180,614
		£371,359
Deduct for empties, losses, &c.—		
First half year	£3,296	
Second ,, ...	3,661	
		6,957
		£364,402
Water supplied to Southwark and Vauxhall Company .		90
		364,492
Expenses, including actual repairs and renewals. . .		131,027
		233,465
Tenant's share		23,100
		210,365
Extra maintenance beyond £27,493, included in expenses		7,000
Rateable value of whole undertaking, and rates thereon		£203,365

The allowance for tenant's capital in this valuation was £131,648, making the 17½ per cent., as claimed by the appellants, £23,100.

The average for fifteen years' maintenance was—

On reservoirs and works	£0·44
On mains and pipes	1·11
	£1·55
Deduct for lowering mains	0·12
	£1·43

15,599 million gallons supplied in account year at £1·43 = £22,306, as against £27,493 spent, and allowed under the head of expenses; so that, with the addition of £7000 allowed under the head of extra maintenance, the total was £34,493, which was 54 per cent. above the average spent per million gallons supplied the last fifteen years.

Mr. *Eve* explained that he had based his valuation upon the amount of tenant's capital actually expended during the account year.

In cross-examination by Mr. BALFOUR BROWNE, witness said the remainder of expense incurred would be paid after the account year.

Mr. BALFOUR BROWNE: And because it was paid perhaps a month afterwards, you have left it out altogether?

Witness: No; that is not so.

Then what have you done?—I have only allowed the amount actually spent by the tenant in the account year.

You have not given then in your table one penny for profit?—No. The tenant cannot have 17½ per cent. allowed him as profit. I never heard of such a proposition.

Are you going to allow him the 17½ per cent. at the end of the year only?—He will have the 17½ per cent.

He must live on it during the year; he must have some money to go on with?—Certainly.

And you have not allowed him a penny. Do you really think we let people keep our money an undue period?—I do.

Witness (continuing) admitted that the Company were as wishful to get their money as any other creditor would be. The tenant's profit, according to his figures, was £23,100, making £11,550 for the half year; and he was entitled to have that at the end of the half year. With regard to the sinking fund, the table he had put in was intended to show that, with the sinking fund based on 47 years, they would at the end of 16 years have in hand £1,647,522, less anything which had been paid for renewal. The table did not assume that the costs of pumping per million gallons would remain very much the same; it had nothing to do with pumping at all. It did not affect the question one iota. It had to do with the maintenance of pumps and mains, and everything necessary for getting a supply; but he did not admit that a fallacy would be introduced into the table if men worked fewer hours now than in the earlier period taken. As to the life, Mr. Marshall's figure came to 46 or 47 years, which was too short, and applied to too large an amount. In his (Mr. Eve's) valuation, he had put the whole of the repairs of mains upon the landlord, but denied he had divided the repairs and renewals equally between the landlord and tenant.

In re-examination by Mr. MARSHALL, witness said, in his opinion, his valuation was perfectly fair, and the proper one to take.

Mr. *George F. Deacon*, M.Inst.C.E., examined by Mr. MARSHALL, criticized the values which had been placed by the Company upon their engines, wells, reservoirs, &c., which, he said, were greatly over-estimated. As to the filter-beds, the usual method of construction was to build partly below and partly above the ground. In certain parishes, they were beneath the ground, which made the cost much greater than it would be under ordinary circumstances; and this had been admitted by Mr. Hunter.

The inquiry was adjourned till Monday (yesterday).

Messrs. Newbigging and Son have been instructed to prepare specifications and quantities for the erection of an installation of inclined retorts at the Shipley Gas-Works.

TEIGNMOUTH WATER SUPPLY.

The question of the water supply of Teignmouth is becoming a little complicated. Since the District Council adopted in principle the offer of the Torquay Corporation, as recorded in last week's "JOURNAL," two other proposals have received attention. One is a revival of the scheme to obtain a supply from the new works of the Paignton District Council. This, it is urged, can be made available without anything like the long delay which was feared; and as it is a cheaper supply, and leaves Teignmouth master of its existing debt, it is very strongly pressed by some of the ratepayers. Another scheme is to obtain a supply from the East Webburn River at Widdecombe-in-the-Moor. This is put forward by Baron de Hochepied, who is fortified by the opinion of Mr. F. B. Nicholson, an Engineer, and Mr. Downey, a Contractor. The cost of the scheme, which involves the laying of 24 miles of mains, is put at £45,000, or, including parliamentary expenses and contingencies, £50,000; and a guarantee is given that it shall be available in six months from the time the order is given. This is a more fascinating scheme than either of the others, because it works out at less cost, and leaves the town absolutely master of its own supply. Both this and the Paignton scheme have been considered by meetings of ratepayers called by the parties interested. The ratepayers approved of both; but as they also approved of the Torquay scheme when the Council seemed disposed to hang back, it is not easy to obtain guidance from their decisions.

Outdoor Lighting by Acetylene.—A complete installation for lighting the Marine Promenade at Whitehead, Belfast, with acetylene gas has just been carried out by the Sunbeam Acetylene Gas Company, Limited. The light has been tested, with very satisfactory results; the array of brilliant lamps, extending the whole length of the promenade, being a very pretty sight. The work of laying the mains and erecting the standards has been done by the Belfast and Northern Counties Railway Company's employees. It is stated that acetylene is already in use in the Presbyterian Church; and that it is likely to be the system adopted for the public lighting of the roads and streets in Whitehead.

Gas Explosion at Blackburn.—There was an alarming fire, followed by an explosion, at the Manchester and Liverpool District Bank at Blackburn on the evening of Friday, the 22nd ult. Flames were seen in the cellar beneath the counting-house, and firemen descending found gas escaping from the supply-pipes. A violent explosion occurred during their search, and drove them back for safety; and the police, fearing a repetition of the Crown Hotel disaster in 1891, when there was serious loss of life, cleared the street. The firemen ultimately succeeded in reaching the gas-main, which was cut and blocked, and further damage thus averted. The fusing of electric wires is supposed to have been the cause of the outbreak.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1443.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 11	10½	Alliance & Dublin 10 p.c.	19—20	..	5 5 0
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	July 1	5	Australian 5 p.c. Deb. .	100—102	..	4 18 0
200,000	5	Nov. 13	6½	Bombay, Ltd. . . .	6¼—6¾	..	4 16 4
40,000	5	,,	6¼	Do. New, £4 paid	4¾—4¾	..	5 9 5
380,000	Stk.	Aug. 15	12	Brentford Consolidated	265—270	..	4 8 11
270,000	,,	,,	9	Do. New	192—197	..	4 11 5
50,000	,,	,,	5	Do. 5 p.c. Pref. .	130—135	..	3 14 1
206,250	,,	June 14	4	Do. 4 p.c. Deb. .	114—117	..	3 8 5
220,000	Stk.	Sept. 12	10	Brighton & Hove Orig.	222—227	..	4 8 1
246,320	,,	,,	7	Do. A. Ord. Stk. .	155—160	..	4 7 6
1,047,500	Stk.	Aug. 28	5	Bristol, 5 p.c. max. .	119—120	..	4 3 4
420,000	20	Sept. 27	10	British.	41—42	..	4 15 3
50,000	10	Aug. 15	12	Bromley, Ord. 10 p.c. .	24—26	..	4 12 4
82,850	10	,,	9	Do. 7 p.c. . . .	19—21	..	4 5 8
500,000	10	Oct. 11	6	Buenos Ayres (New) Ltd.	9¼—9¾	+¼	6 3 1
220,000	Stk.	June 28	4	Do. 4 p.c. Deb.	90—98	..	4 1 8
150,000	20	July 17	8¼	Cagliari, Ltd. . . .	22—24	..	6 17 6
100,000	10	Sept 27	10	Cape Town & Dis., Ltd.	14¾—15½	..	6 9 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
550,000	Stk.	Oct. 11	12	Commercial Old Stock	273—278	..	4 6 4
236,425	,,	,,	9	Do. New do. .	203—208	..	4 6 7
238,237	,,	June 14	4½	Do. 4½ p.c. Deb.	130—135	..	3 6 8
800,000	Stk.	May 31	9	Continental Union, Ltd.	167—172	..	5 4 8
200,000	,,	,,	7	Do. 7 p.c. Pref.	162—167	..	4 3 10
575,000	Stk.	Aug. 29	5	Crystal Palace Ord. 5 p.c.	122—127	..	3 18 9
60,000	,,	,,	5	Do. 5 p.c. Pref.	123—128	..	3 18 2
486,090	10	July 17	10½	European, Ltd. . . .	19—20	..	5 5 0
354,060	10	,,	10½	Do. £7 10s. paid	14—15	..	5 5 0
15,079,885	Stk.	Aug. 15	4 5/16	Gas-light and Coke	4 p.c. Ord. . . .	58—100	..	4 8 0
					3½ p.c. max.	88—90	..	3 17 9
					4 p.c. Con. Pref.	112—115	..	3 9 7
2,600,000	,,	,,	3½		3 p.c. Con. Deb.	92—94	..	3 3 10
2,799,735	,,	,,	4	Hongkong & China, Ltd.	13—14	..	5 14 4
4,063,425	,,	June 14	3	Imperial Continental .	212—217	−1	4 12 2
70,000	10	Nov. 13	8	Do. 3½ p.c. Deb. Red.	100—102	..	3 8 8
3,800,000	Stk.	Nov. 13	10	Liverpool United A	231—233	..	4 5 10
473,600	Stk.	Aug. 15	3½	Do. do. B	170—172	..	4 1 5
561,000	Stk.	Aug. 29	10	Do. do. Deb. Stk.	119—120	..	3 6 8
718,100	,,	,,	7	Malta & Medn., Ltd. .	4½—5	..	4 0 0
306,083	,,	June 28	4	Met. of	5 p.c. Deb.	105—108	..	4 12 7
75,000	5	June 14	4	Melbourne	4½ p.c. Deb.	102—104	..	4 6 7
560,000	100	Oct. 1	5	Monte Video, Ltd. . .	9—10	−½	7 0 0
250,000	100	,,	4½	Newc'tle & G'tesh'd Con.	214—216	..	3 18 8
541,920	20	Nov. 13	3½	Do. 3½ p.c. Deb.	97—99	..	3 10 8
717,946	Stk.	Aug. 3	8¾	Oriental, Ltd. . . .	7⅞—8*	..	5 0 0
312,855	Stk.	June 28	3½	Do. New, £4 10s. pd.	6¾—7¼*	..	4 19 4
150,000	5	Nov. 28	8	Do. do. 1879, £1 pd.	1¼—1⅝*	..	4 11 5
135,000	5	,,	8				
15,000	5	,,	8				

* Ex div.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
60,000	5	Sept. 27	7	Ottoman, Ltd. . . .	5⅞—6¼	..	5 12 0
851,070	10	Oct. 11	7	River Plate Ord. . .	10¼—10¾	..	6 10 3
250,000	Stk.	June 28	4	Do. 4 p.c. Deb. .	95—97	..	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd. . . .	11—12	..	6 13 4
135,000	Stk.	Sept. 12	10	Sheffield A	242—244	..	4 2 0
209,984	,,	,,	10	Do. B	242—244	..	4 2 0
523,498	,,	,,	10	Do. C	242—244	..	4 2 0
5,761,885	Stk.	Aug. 15	5	South Met., 4 p.c. Ord.	123—125	..	4 0 0
1,627,965	,,	July 17	3	Do. 3 p.c. Deb. . .	91—94	..	3 3 10
380,940	Stk.	Nov. 13	5	Southampton Ord. . .	102—106	..	4 14 4
70,825	,,	July 17	4	Do. 4 p.c. Deb.	104—109	..	3 13 5
120,000	Stk.	Aug. 29	5½	Tottenham and Edmonton	A. 5 p.c.	122—127	..	4 6 8
250,520	,,	,,	4		B. 3½ p.c.	95—100	..	4 0 0
182,380	10	Jan. 16	5	Tuscan, Ltd.	8—9	..	5 11 1
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	95—100	..	5 0 0
230,000	5	Aug. 15	9	West Ham, 10 p.c. . .	9½—10¾	..	4 5 9
172,000	10	,,	6	Do. 7 p.c. . .	12½—13¾	..	4 8 11
140,900	Stk.	June 28	4	Do. 4 p.c. Deb.	107—112	..	3 11 5
				WATER COMPANIES.			
780,599	Stk.	June 28	11	Chelsea, Ord. . . .	312—317	..	3 9 5
150,000	,,	,,	5	Do. 5 p.c. Pref. .	152—157	..	3 3 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	140—145	..	3 2 1
175,785	,,	Sept. 27	4½	Do. 4½ p.c. Deb. .	140—145	..	3 2 1
1,720,560	Stk.	Oct. 11	7	East London, Ord. . .	200—205	..	3 8 4
654,740	,,	June 14	4½	Do. 4½ p.c. Deb. .	143—148	..	3 0 10
1,018,046	,,	,,	3	Do. 3 p.c. Deb. .	96—98	..	3 1 3
700,000	50	June 14	8	Grand Junction	10 p.c. max.	117—120	..	3 6 8
310,000	Stk.	Sept. 27	4		4 p.c. Deb.	122—126	..	3 3 6
708,000	Stk.	Aug. 15	14	Kent	300—305	+1	4 11 10
160,000	,,	,,	7	Do. New, 7 p.c. max.	200—205	..	3 8 4
1,043,800	100	June 28	10½	Lambeth, 10 p.c. max.	298—303	+1	3 9 4
406,200	100	,,	8	Do. 7½ p.c. max.	217—222	..	3 12 1
350,000	Stk.	Sept. 27	4	Do. 4 p.c. Deb.	125—130	..	3 1 7
500,000	100	Aug. 15	12 5/10	New River, New Shares	395—405	..	3 3 2
1,000,000	Stk.	July 31	4	Do. 4 p.c. Deb.	125—130	..	3 1 7
902,300	Stk.	June 14	6	South-wark and Vauxhall	Ord. . . .	198—203	..	2 19 1
126,500	100	,,	6		7½ p.c. max.	185—190	..	3 3 2
489,200	Stk.	,,	5		5 p.c. Pref. .	150—155	..	3 4 6
1,019,585	,,	Oct. 11	4		4 p.c. A Deb.	124—129	..	3 2 0
1,155,066	Stk.	June 14	10	West Middlesex. . .	290—295	..	3 7 10
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	138—143	..	3 2 11
200,000	,,	Sept 12	3	Do. 3 p.c. Deb. .	94—97	..	3 1 10

* Ex div.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners are about to apply for a Provisional Order empowering them to borrow a further sum of, I am told, £150,000, for the purposes of their undertaking. If this be the amount decided upon, it will make a capital of £950,000 borrowed on mortgage. When the Commission was constituted in 1888, the borrowing powers were fixed at £300,000. This sum sufficed till 1894, when, to meet the cost of the extension of mains and the introduction of mechanical stoking and coal-breaking plant, power to borrow a further sum of £100,000 was obtained. Then in 1898, for the purpose of meeting the cost of the erection of the new works at Granton, power to borrow a further amount of £400,000 was secured; making £800,000 in all. Of this sum, there only remains to be borrowed £139,343. At a recently held meeting of the Loans Commissioners, the Treasurer (Mr. J. S. Gibb) reported that this sum will be needed to pay off probable liabilities before Whitsunday next; and the Gas Commission have obtained the sanction of the Loans Commissioners to raise the money on mortgage. The Commission have also remitted to the Finance and Law Commissioners to consider as to the terms of the Provisional Order which it will be necessary to procure before they can borrow more money, and to report as to that matter, and as to any amendments they may consider expedient of their Acts of Parliament.

Provisional Orders are also being promoted by the Corporation of Glasgow, who seek authority to the agreement which they have come to for the transfer to them of the undertaking of the Milngavie Gas Company; by the Bridge of Earn Gas Company, who wish to raise capital to defray the cost of introducing a supply from the Perth Gas-Works; and by the Bothwell and Uddingston Gas Company, Limited, who seek to extend the area of supply, to increase the capital of the Company by the creation of 5000 new shares of £1 each, upon which the full amount will be paid (the new shares to be offered to the shareholders at par, and to be considered as part of the original capital), and to divide £4959—part of the reserve fund—among the shareholders, in the form of a bonus at the rate of 5s. 6d. per share.

At Monday's meeting of the Edinburgh and Leith Gas Commission, the first item of business was a feeling reference made by the Chairman (Provost Maclin, of Leith) to the death of Mr. Kinloch Anderson, and their resolution, upon his motion, to record their deep sense of the great loss which the Commission had sustained by Mr. Anderson's death. Bailie M'Kelvie, of Leith, did an act which savoured of the ungracious, in his opposition to the recommendation of the Works Committee that the Engineer (Mr. W. R. Herring) be allowed £110 a year to meet the cost of the upkeep of the grounds of Granton House. In his opinion, the proposal was only an attempt to increase the Engineer's salary without showing that there was any necessity for so doing. He thought Mr. Herring was amply paid already for the work he had to do, and that in the present condition of trade the proposed increase should not be given. The Chairman said that Mr. Kinloch Anderson had something to do with the matter, as he had made a verbal promise that something would be done. The Commissioners found that it would be very hard upon Mr. Herring to have thrown upon him a piece of ground for which he had no use—a white elephant, in fact. Mr. Purves thought it was very unfair that such remarks as Bailie M'Kelvie's should have been made at a meeting of the Commissioners; Bailie M'Kelvie should have gone to the meeting of the Works Committee, and spoken there. Bailie M'Kelvie's motion was not seconded; and the recommendation of the Commissioners was thus agreed to. I suppose Bailie M'Kelvie has not forgotten the incidents of the coal purchases in the beginning of April last, when Provost Maclin and he, with three other Commissioners, objected to the procedure adopted by the Commissioners, which, of course, was upon Mr. Herring's advice.

The Works Committee reported that they had received a complaint from the Joiners' United Trade Committee, to the effect that labourers had been employed at Granton to do joiners' work; and that, having heard Mr. Herring's explanations, they instructed the Clerk to reply that the Committee were satisfied that there was no ground for complaint, and to explain that the paying off of the joiners referred to was not due to the reasons indicated, but to the want of work for them. To the Clerk's letter there had been received a reply to the effect that the Committee had received the communication with extreme surprise and disappointment, and that their attitude towards the men, in addition to being a just cause of complaint, really amounted to a public grievance. They were looking beyond the narrow interests of their own trade; and should they fail to get from the Commissioners a complete recognition of the grievance they complained of, some other mode of dealing with the matter must be tried. This letter was sent to the Works Committee for report. As to which, I would say that this is not by any means the first time that a fancied grievance has come to be believed in, because of its reiteration and expansion into something which was not narrow and local, but wide in its issues and general in its application.

Some time ago, an action was raised in the Sheriff Court at Cupar, by the Cupar Gas Company, against W. Briggs and Sons, Limited, of Dundee and Ladybank, in which the Company sued for £209 15s. 4d., as the price of tar which they had delivered to the defenders, and for £500 as damages for alleged breach of contract by failing to take the tar produced in the Company's works during the current year. The Company also petitioned the Court for authority to sell the tar and ammoniacal liquor made and to be made by them during the year, in so far as not taken delivery of by the respondents. To this petition, the reply was that the tar and liquor were not of the specified strength. The actions have been settled and taken out of Court by joint minutes. The defenders have paid the sum first sued for, and the expenses of the process; and it was agreed that the conclusion for damages should be dismissed. In the petition, the Company have been allowed to uplift a sum of £150 which the respondents had consigned in Court; and the expenses of the Company having been paid, the parties consented to the petition being dismissed.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

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W. H. PEARSON, Junr., Deputy-Chairman.
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L. L. MERRIFIELD, M.Inst.M.E., Engineer.

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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.
BLACKBURN	1,250,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

ORDERS RECEIVED IN 1901 TO MARCH 1 . . . . 3,500,000 CUB. FT. DAILY.

MALTON . . 150,000 Cubic feet. **SMETHWICK . . 500,000 Cubic feet.**

Of late there has been quite a demand for gas-engines in Greenock. Messrs. Caird and Co., engineers and shipbuilders, have introduced two into their yard, both of them working up to 20-horse power. Mr. James Lamont, a boilermaker, has had one of 14-horse power fitted up on his premises; and Messrs. Cook and Blair, grain merchants, have increased the capacity of their gas-engine from 14 to 24 horse power.

A report has been prepared by the Resident Electrical Engineer of Edinburgh for the members of the Electric Lighting Committee of the Town Council, giving a comparison of the electrical output, cost, &c., of the Edinburgh Corporation Electric Lighting undertaking for the periods from May 15 to Nov. 21, 1900 and 1901—that is, for the first 27 weeks in each year. The equivalent in 8-candle power lamps connected to the supply-mains in the period mentioned in 1900 was 47,695; and for the same period in 1901, 52,436—the total now connected being 431,016 8-candle power lamps. The total horse power for motors is 8443, of which 361 have been connected since May 15. For the year 1900-1, a loss was incurred each week until Oct. 4; the total estimated loss being £9443. This year a profit was made during the week ending Sept. 26—that is, a week earlier; and the total estimated loss was £8515. From Oct. 5 to Nov. 22, 1900, a profit of £1875 was made; but from Sept. 26 to Nov. 21 of this year the profit was £3821—an increase of £1946. The estimated loss to the end of the 27th week of 1900 was £7568, against £4694 for the same period this year. There was thus a smaller loss this year by £2874 than last year; while the weekly profit was considerably larger. A statement as to the estimated income, cost, and profit for the 27th week in 1900 and 1901 shows, for 1900, an estimated income of £2480, against £2708 in 1901; cost, 1900, £1877; 1901, £1737; profit, 1900, £603; 1901, £921. The largest output during the 27 weeks of 1900 was 4595 kilowatts, equivalent to 143,560 8-candle power lamps alight at the same time; for this year, it was 5546 kilowatts, or 173,310 8-candle power lamps. The comparison of cost for the 27 weeks for 1900 shows: Works cost per unit sold, 0·868d.; for 1901, 0·561d. Total cost per unit sold: 1900, 2 158d.; 1901, 1·866d.

Abertillery Water Supply.—A statutory meeting of ratepayers has been held to consider the proposal of the Abertillery District Council to promote a Bill to make further provision with regard to the water undertaking, and for other matters. Some particulars of the scheme were given in the "JOURNAL" for the 19th ult. (p. 1334). After some discussion, it was decided, by 47 votes to 1, that the Bill should be promoted in the ensuing session of Parliament.

Incandescent Gas Lighting at Leighton Buzzard.—The Leighton Buzzard Gas Company have just fixed 36 new incandescent lamps in various parts of the town; bringing the number now in use in all the main thoroughfares up to 78. No extra charge is made for them; but the effect of their installation has been to light the portions of the town where they have been placed far better than could be done by electric lamps, judging from the results obtained with the latter in neighbouring places, where a great deal of money has been spent with most disappointing results.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 30.

Sulphate of Ammonia.—There has been a quieter market all through the week; and on the west coast prices have barely been maintained. Heavy shipments from London to Spain during November have brought values at the different ports more into line; and the closing quotations are £10 17s. 6d. per ton f.o.b. Hull, and £11 per ton f.o.b. Leith and Liverpool. Supplies have become rather more plentiful than was the case a week or two ago; and buyers have had less difficulty in covering their requirements. There is not much to report in the forward position. Makers adhere to their quotation of £11 5s. per ton, ordinary terms, f.o.b. Leith, for delivery over spring months; but this price is not obtainable against speculative offering at a lower level which is going on abroad. London, Beckton terms, January-March delivery, is also held for £11 5s. per ton.

Nitrate of Soda is steady on spot at 9s. 3d. to 9s. 4½d. per cwt., according to quality; and the forward position is further strengthened my decreasing visible supply. Nevertheless, buyers remain for the bost part stolidly indifferent about purchasing ahead.

LONDON, *Nov.* 30.

Tar Products.—Pitch remains in the same position. Owing to the low freights ruling from London, the demand is considerable, and it is difficult to estimate the exact value. Business in South Wales continues good; and the demand for December delivery is very strong. Some contracts have been made for January-June; but consumers decline to purchase all over 1902, believing in lower prices later on. 90 per cent. benzol is decidedly better. Business has been done at 11d. for November-December; and a sale is reported at 11½d. for January-June. There is a fairly good demand for 50-90 per cent. at 9½d. January-June; but makers as a rule ask 10d. over this period. Crude carbolic is steady, but quiet. Business has been done in 50's at 1s 7½d. for prompt delivery; while one or two contracts have been made in 60's at 1s. 11d. all over 1902. Crystals are much firmer, especially 34-35's, for which there appears to be a good inquiry for December shipment. Creosote is very firm in London; but there is rather more offering in the North, especially for January-June. In anthracene, there is no actual business doing; but there are buyers of 40-45 per cent., best quality, at 2¼d. per unit. In "B" qualities, several parcels have been offered at 1½d. without finding buyers—in fact, it would be difficult to place 30-35 per cent., even at 1¾d. per unit. Tar remains in the same position.

The average values obtaining during the week are: Tar, 15s. to 18s. Pitch, east coast, 35s. to 35s. 6d.; west coast, 34s. to 34s. 6d. Benzol, 90's, 11d. to 11½d.; 50's, 9¾d. Toluol, 10d. Crude naphtha, 4½d.; solvent naphtha, 11d.; heavy naphtha, 10d. to 11d. Creosote, London, 1⅞d.; North, 1¼d. Heavy oils, 2¼d. to 2⅜d. Carbolic acid, 60's, 1s. 11d. Naphthalene, 60s. to 80s.; salts, 30s. to 45s. Anthracene, "A," 2d. to 2¼d.; "B," 1d. to 1¼d.

Sulphate of Ammonia.—The market continues steady; but there is

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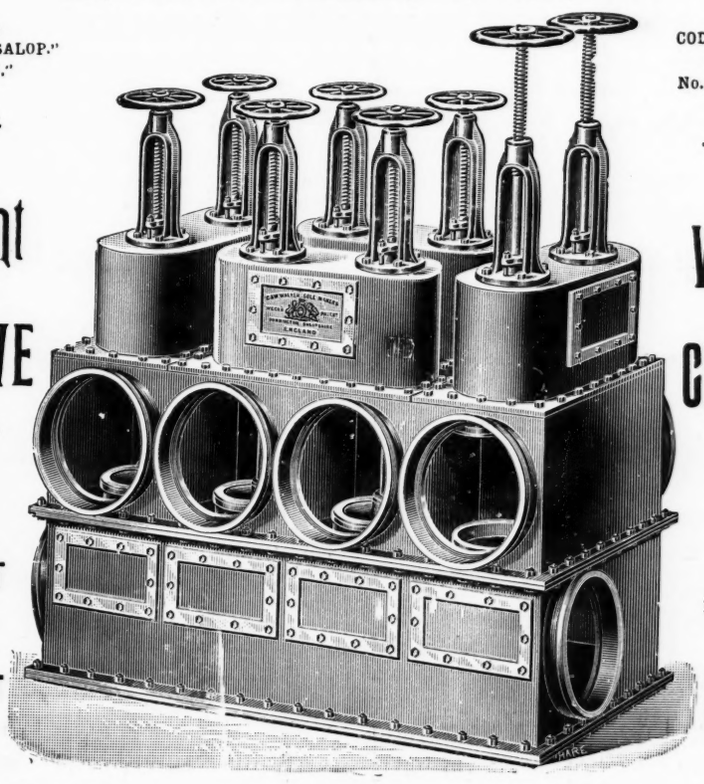

Weck's Patent CENTRE-VALVE

PERFECTLY TIGHT UNDER EVERY EXTREME OF HEAT OR COLD.

THE ONLY ABSOLUTELY RELIABLE CENTRE-VALVE IN THE MARKET.

not quite such a good demand for November-December. The Gaslight and Coke Company remain firm at £11 5s. per ton for January-June; but this price has not yet been paid by consumers. In Hull, business has been done at £11, for shipment early in January at £10 17s. 6d., but £10 18s. 9d. may be taken as the value for early shipment. In Leith, business is quiet; but there is not such a good inquiry as during last week. The market value may be taken as £11 for December shipment. Liverpool remains in the same position. The price is fairly steady; but there is not a strong demand for prompt shipment.

COAL TRADE REPORTS.

Lancashire Coal Trade.—The position continues strong in all descriptions of round coal; but prices, although firm at full list rates, remain unchanged from last month. House-fire qualities are in brisk request, and the output of the pits is insufficient to meet the present demand, with the result that a good deal of stock is being filled up. At the pit, quotations are fully 15s. per ton for best Wigan Arley, 13s. to 13s. 6d. for Pemberton four-feet and seconds Arley, and 11s. to 11s. 6d. for common house coal. Common round coal for steam and forge purposes is also moving away readily, as there are now lessened supplies on the market, owing to the increased demand for common house-fire consumption; and prices have stiffened up slightly upon recent specially low quotations—9s. to 9s. 6d. per ton at the pit being about average figures for good qualities. The better sorts of engine fuel are not over-plentiful in the Lancashire district, and collieries are able to maintain their prices on the basis of about 7s. to 7s. 6d. at the pit. The inferior sorts of slack, however, continue more or less a drug, owing to the competition of low-priced engine fuel from outside districts; and from 5s. 6d. upwards still represents about the basis of Lancashire pit prices, with common slack in outside districts offering from as low as 2s. and 2s. 6d. upwards at the pit. The shipping trade is moderate, with prices slightly improved on recent cut quotations; 10s. 6d. to 11s. per ton being average figures for steam coals at the ports. The coke trade continues steady, with best Lancashire foundry qualities averaging 22s. to 24s. per ton, and best washed furnace cokes quoted from 13s. 6d. to 15s. at the ovens.

Northern Coal Trade.—There has been with the milder weather of this week a steadier production of coal in the North; and the quantities sent out have been very heavy—contracts taking much of the total. Best Northumbrian steam coals are now from 10s. 9d. to 11s. 6d. per ton f.o.b., unscreened steams are 9s., and steam smalls 6s.; the demand being fuller, though this is probably largely due to the heavy arrivals of steamers that had been delayed. The gas coal trade is very active, and the heavy output is well taken up; the deliveries on contracts being now about at the highest point of the year. Prices of best Durham gas coals are rather irregular; but for occasional cargoes they may be said to vary from 12s. to 12s. 6d. per ton f.o.b., while for contracts over a period the common quotation is from 9s. 6d. to 10s. 3d. per ton f.o.b. There is a steady tone in the gas coal trade; and its prospects seem at the moment to be better than those of other branches of the fuel industries of the North, partly owing to the continued enlargement of the consumption. Coke is steady. Best Durham coke is from 18s. to 18s. 6d. per ton f.o.b., blast-furnace coke about 17s. at the furnaces, and gas coke about 13s. f.o.b.

Scotch Coal Trade —There is no change in the situation since a week ago. Scotch coal is relatively dearer than North of England coal; and, as a consequence, orders can scarcely be secured. The fact that duty will be charged upon all coal shipped under new contracts is also exercising an adverse influence upon inquiries for coal to be delivered abroad next year. The prices quoted are: Main 9s. to 9s. 3d. per ton, f.o.b. Glasgow, ell 10s. 3d. to 11s. 3d., and splint 10s. 9d. to 11s. The shipments for the week amounted to 184,948 tons—an increase of 417 tons upon the preceding week, but a decrease of 4818 tons upon the corresponding week of last year. For the year to date, the total shipments have been 8,946,355 tons—a decrease of 1,022,366 tons upon the same period of last year.

Vyrnwy Water for Wallasey.—The Liverpool Corporation Water Committee have accepted the tender of Messrs. Holme and King, Limited, of Liverpool, for the laying of a pipe-line for supplying the Wallasey district with Vyrnwy water. It will tap the Vyrnwy main at Delamere, proceed to Wallasey *viâ* Neston, and will be about 31 miles long. The cost will have to be brought within the borrowing powers sanctioned by the Local Government Board for the purpose—viz., between £140,000 and £150,000.

Honiton Water Supply.—An inquiry was held at Honiton last Wednesday, by Mr. W. O. E. Meade-King, one of the Local Government Board Inspectors, in connection with an application by the Town Council for power to borrow £2450 for works of water supply. The subject has been under consideration for a long time, and has caused a great deal of feeling. The present proposal is to construct a reservoir to afford additional storage, and to relay some of the pipes. Mr. H. B. Nichols, the Engineer called in to advise the Corporation, said it was proposed to construct a reservoir with a capacity of 125,000 gallons, which would give four days' full supply, and to carry a 6-inch main from the collecting-well to the reservoir, with an intercepting high-pressure reservoir. Believing there was no likelihood of the population of 3000 increasing considerably, he was of opinion that a supply of 15 gallons per head, or 45,000 gallons per day, was sufficient. The scheme was strongly opposed; a petition signed by 381 out of 620 ratepayers being handed in against it It was contended that the water was liable to pollution at its source, that the supply was inadequate and the tenure of the land insufficient, and that there was another source which was much superior. The Inspector declined to hear evidence as to an alternative scheme. The Deputy Town Clerk (Mr. C. N. Tweed) said there had been eleven schemes before the Council, eight of which were somewhat on the lines of the present one. This plan had been under consideration for six months, which afforded plenty of time for the alternative scheme to be put forward if its advocates wished it to be considered.

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PUBLIC LIGHTING DEPARTMENT, YORK STREET, WESTMINSTER, LONDON, S.W.

Reduction to Large Gas Consumers at Dudley.—The Dudley Gas Company have decided to allow a special discount of 10 per cent. off the price of gas used for motive power, providing that 2 million cubic feet per annum are taken. The local Chamber of Commerce have resolved to thank the Company for their concession, and to ask them to meet the smaller consumers on a graduated scale—viz., consumers of over ½ million cubic feet, 2½ per cent.; over 1 million, 5 per cent.; and over 1½ millions, 7½ per cent.

Hornsey Gas Company.—At the meeting of the Wood Green District Council on Wednesday evening, the Works and General Purposes Committee brought forward a communication from the Hornsey Gas Company applying for the consent of the Council to construct additional works in Wood Green within the Council's district. Nothing was indicated as to what would be the nature of the buildings, beyond their proposed situation; and the Committee had directed the Surveyor to obtain from the Company, in writing, details of the works they proposed to carry out. These details were not yet to hand; and after some abortive discussion, the matter was allowed to stand over.

Gas Workers' Wages at Leeds.—The question of the wages paid to the gas workers at Leeds has for some time been under discussion; the several classes of men employed having asked for an advance of 6d. per shift. At the beginning of last month, the Gas Committee offered some concessions; but these the men rejected. On Wednesday last, the Commitee decided to propose a general advance of 4d. per shift to stokers, firemen, coal-wheelers, and cinder-throwers, without any alteration of present arrangements as to the amount of work—the Committee stipulating, however, that no man should work more than six shifts per week. The men have passed a resolution accepting the offer of an increase of 4d. per shift, without conditions as to extra work, and expressing a hope that the City Council will approve of the arrangement. With regard to the question of six shifts per week—a system which would involve sections of the men "playing" a day in turns—a resolution was passed to the effect that the matter is so complicated that it ought to be left over for mutual consideration, if necessary.

Condition of the Clonmel Gas-Works.—The Clonmel Corporation have held a special meeting to consider an important report of the Gas Committee. It appears that the Committee, having become dissatisfied with the condition of the works (which were acquired some six years ago), requested Mr. J. H. Brown, of Ilford, to make a thorough investigation. Mr. Brown reported that the gas was produced under an old-fashioned system—in fact, little or no advantage had been taken of the improvements of the past twenty years; and by adopting modern ideas, the production would be much increased and improved. He detailed how this was to be done, and said the make could be increased by about 25 per cent. He also strongly favoured the introduction of cooking-stoves, and the slot-meter system. The mains would in many instances have to be relaid. This would cost about £1000; while the other improvements would cost £1500. The report was adopted unanimously; and the Chairman said they hoped to increase their profits, by the changes proposed, by about £500 a year.

Heywood Water-Works Extensions.—Important works have recently been carried out at the Naden higher reservoir of the Heywood and Middleton Water Board. A sliding movement in a part of the embankment has caused anxiety for many years; and to arrest this, a concrete wall, 620 feet long and 20 feet thick, has been constructed at the foot of the embankment. The storage capacity has also been increased from 55 to 80 million gallons; the whole work having cost about £43,000. A new reservoir is now being constructed on Ashworth Moor, which, when completed, will hold 350 million gallons, and practically double the storage power of the Board.

Barry Gas and Water Supply.—Mr. F. M. Harris, the Gas Engineer at Barry, has superintended the construction of a huge gas-holder and of the first of a series of new purifiers; the connections to the former being made on the 18th ult., while one of the purifiers was put into use last Sunday week. This additional plant enables the works to supply up to 200 million cubic feet of gas annually. The development of the works within the last decade has been extraordinary; the whole town of approaching 30,000 inhabitants having sprung up within 20 years. The rapidity of the growth has, however, been arrested; but it is interesting to know that the Council have appointed a Sub-Committee to visit the works with a view to adopting the system of inclined retorts, as recommended by Mr. Harris. On Monday of last week, the Council discussed with the Auditor of the Local Government Board the method of accounts by which the profit made upon the gas undertaking has been devoted towards liquidating losses on the water-works. This the Auditor has declared to be improper. In order to legally meet the deficiency arising from the water-works, the Council are taking steps towards securing in the next session of Parliament a Provisional Order granting them the powers they require under the altered system.

Gas-Engine Development.—At the meeting of the British Westinghouse Electric and Manufacturing Company, Limited, on Monday last week, the Chairman (Mr. George Westinghouse), in the course of his address, referred to the development of the gas-engine business. He remarked that one of the greatest of modern problems was how economically to turn fuel into power and to recapture and utilize gases, now lost or wasted, from blast-furnaces. A Company had been formed to distribute Mond producer gas over South Staffordshire; thus opening out a new and large field for gas-engines. Already in America the Westinghouse Company had made gas-engines of 650-horse power; and they were now constructing one of no less than 1500-horse power. A similar demand was arising in this country. These considerations had led the British Company to decide on combining the manufacture of gas-engines with that of electrical machinery under one roof. The same people who required dynamos required gas-engines, for it was proving to be more economical to convert coal into gas and gas into electricity than to burn coal under boilers to drive steam-engines. During the past year, twelve important gas-engine installations, aggregating 3000-horse power, had been sold; and negotiations were pending for upwards of 10,000-horse power of larger units.

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Faversham in Darkness.—There was a very high tide at Faversham at mid-day on Thursday, causing much discomfort and inconvenience to those residing on the Quays, and some amount of damage to their belongings. The water also made its way into the Gas Company's works, with the result that in the evening the town was in semi-darkness.

Protection of the Leeds Water Sources.—The Leeds Corporation Water Committee are still buying land in the Washburn Valley, in order to secure the water from impurities. With the approval of the City Council, it is proposed to purchase from Lord Walsingham the Intake Farm Estate at Blubberhouses, comprising upwards of 733 acres, together with all the farm buildings, the hall, and the Frankland Arms, with the timber thereon. The price agreed upon is £30,500. The sporting rights are to be reserved to his Lordship; but the Corporation are to have full rights of sheepgate and turbary as now exercised over the moorlands.

The Leakage at the Butterley Reservoir.—It has been known for some time that the Butterley reservoir, which has been constructed by the Huddersfield Corporation in the Wessenden Valley, above Marsden, allows water to escape after a height of 40 feet has been attained; and there have been fears that this leakage would result in serious damage, if not in loss of life. It is satisfactory to learn from the Engineers (Messrs. Hawksley and Crowther) that there is not the slightest fear of the walls giving way. These gentlemen recently met the Water Committee of the Corporation, and made certain recommendations for remedying the defect; and the Council will take the necessary measures as speedily as possible. The reservoir bank is reported to be as sound as a bell; and no fear need be apprehended on this score.

Penzance Water Supply.—A report was presented to the Penzance Town Council on Wednesday last, in which the Borough Surveyor strongly urged the necessity of immediate attention being paid to the water supply. The pumps, rods, and timbers of the old well were, he stated, in a very precarious condition; and as it was impossible for the supply of the town to hold out in the summer time with a constant service without the aid of a well, the fitting up of the new one should be taken in hand at once. It was also advisable that better provision should be made for the supply of the higher districts of the town. In order to effect the necessary improvements, the question of the well, the machinery, and the high-level tank should be taken in hand in a speedy and businesslike manner. The new well had been very successful; and on the 31st ult. was yielding at the rate of 250,000 gallons per day. He advised the Council to put down an oil-engine for the purpose of working the pumps, which should be capable of raising 25,000 gallons of water to a total height of 135 feet an hour. An approximate estimate of the cost of the scheme was £5990, including £1500 for sinking the well and driving an adit, £1000 for a high-level reservoir, £800 for a new main, £600 for the engine, and £800 to £1000 for pumps. It was decided to hold a special meeting of the Council to consider the subject.

Settlement of the Gas Dispute at Rhos.—A largely-attended meeting of ratepayers has just been held at the Public Hall, Rhos, presided over by Alderman E. Hooson, to reconsider the dispute between the Gas Company and the Parish Council relative to the price of gas. The Chairman said the Council had gone very fully into the matter, and a deputation had waited upon the Company. The Council recommended that they should accept the terms of the Company—viz., 4s. 2d. per 1000 cubic feet—for the present season, but that they should only pay them 4s., and he would pay the difference. Mr. J. Connard proposed that they accept the terms of the Company, and pay the charge themselves as ratepayers. Mr. S. Evans seconded the proposition, which was supported by several of those present. Mr. T. Williams proposed that the recommendation of the Council be accepted. In the result, it was decided to pay 4s., and accept the Chairman's offer to pay the difference. The public lamps will therefore be lighted at once.

Gas Explosions.—An explosion which did considerable damage to the house and furniture took place at 17, Longfield Terrace, Plymouth, on Thursday morning. It proved to be due to a leakage from the main in the street, which had been fractured at a point opposite the house. The escaping gas found its way into the building, and the explosion resulted when a fire was lighted in the kitchen. Although the house was very much damaged, its occupants were uninjured; but one of them—an elderly bedridden woman—had to be carried out through the window. An alarming explosion, resulting in serious injuries to five men, occurred early the same morning in the "B" (Erectors') Shop in the Swindon G.W.R. Works The sufferers were removed to the G.W.R. Hospital, where they were detained. The explosion was the result of an escape of gas from a wrought-iron pipe, which had become corroded. An explosion, followed by an outbreak of fire, recently occurred at the Manchester, Liverpool, and District Bank, Blackburn. The firemen were quickly on the spot, but on entering the cellar another explosion occurred, while a third and louder one followed upon the discovery of an extensive leakage in the gas-main. An examination of the cellar showed that a large gas-pipe had been fused by electric light wires lying across it.

"In producing gas," says a correspondent in the "Bedfordshire Standard," "luminosity is expensive. It is also, to say the least, useless when applied to a bunsen burner, whether for light with a mantle, for heat with a stove, or for power with an engine. The Commercial Gas Company are going to apply to Parliament for permission to lower the illuminating power of their gas from 16 to 15 or 14 candles; a penny being taken off the price for each unit of candle power. When Bedfordshire appreciates gas 'poor and pure,' and Luton has a candle power of 12 instead of 19, the consumers may realize a reduction in price, and with perhaps cleaner ceilings. With the Welsbach mantle and its many rivals, the results of burning 12 and 19 candle power gas are practically the same. The difference in the cost of making two such gases may not be 7d., but certainly some pence."

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Our Gas-Fires are proclaimed the most Brilliant and Best Finished procurable.

Overheard in Railway Carriage:—

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Don't tie yourself and Consumers to **any** Cookers, but wait just a few days and see the

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It is the most up-to-date and cheapest Slot Cooker in the Trade. Made in three sizes.

FIRST-CLASS WORKMANSHIP.
MOST MODERN DESIGNS.
FIRST AND LOWEST COST.

CONTRACTS ARRANGED FOR ONE, THREE, OR FIVE YEARS.

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OLD TOWN FOUNDRY, **LEAMINGTON SPA.**

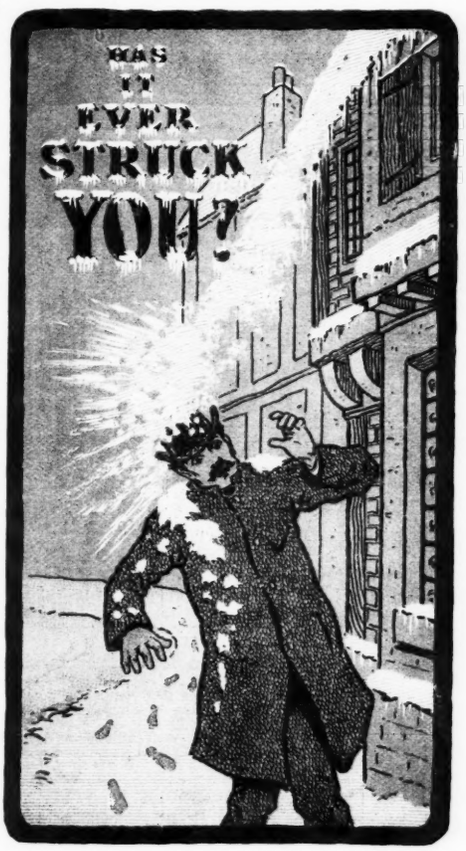
Messrs. Joseph Taylor and Co., of Bolton, have recently received an order from the Louth Gas Company for a solid-plate lead saturator of their latest make, to be fitted with double detachable ammonia pipes, detachable acid pipe, lead lips for timber lagging, and drainer-mouth.

In the twelve months covered by the fourth annual report of the Russian Petroleum and Patent Fuel Company, it is stated that the production of crude oil, after deducting that used as fuel, amounted to 32,515,740 poods, comparing with 34,076,353 poods in the previous year; 18,899,836 poods having been obtained from wells bored by the present Company.

The General Secretary of the Gas Workers' Union (Mr. W. Thorne) states, in his last quarterly report: "We have recovered the sum of £1020 3s. 7d. in compensation for our members; and the total amount now recovered stands at £15,662 6s. 11½d. We have spent £2529 0s. 5d. in dispute pay, the greater portion of which was for the Swansea builders' labourers, who have now been out on strike for the past five months, and there appear to be no signs of any settlement. Several disputes have taken place this quarter through members striking without any authority from the Union officials. All members should understand that unless we have proper discipline neither this nor any other organization can work upon business lines."

Evidence was afforded last week of the fact that managers of electricity generating stations are as keenly alive as their brethren in the gas profession to the advantages of labour-saving appliances; for the New Conveyor Company, Limited, of Smethwick, received a very large order from the Leeds Electric Lighting Department for machinery, which will enable coal to be taken out of boats and put into stoker hoppers without any hand labour, while the ashes will be removed on a hot-coke conveyor, which deposits them into carts without any manual assistance whatever.

The annual tea and smoking concert of the Hastings Gas-Works Cricket Club was recently held in the Board room of the Company, in Queen's Road—Mr. C. E. Botley occupying the chair, and Mr. C. F. Botley the vice chair. There were about 150 present, among the company being the Borough Member, Major Freeman-Thomas, who distributed the prizes given by the Messrs. Botley and by himself and the other Vice-President of the Club (Mr. Peploe). In response to the toast of his health, Major Freeman-Thomas referred to the Company's servants now in South Africa, and expressed his pleasure at learning that one who had returned had been taken on at the works. He said he had also heard that the wives of the men out there were being looked after by the Company. This was a matter for extreme satisfaction, and an example for the rest of the country, and one which he trusted all companies would take up and follow as far as possible.



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What a close relation there is between **Temper and Temperature?** Perhaps you have come downstairs on a snowy winter morning to find the breakfast room as smoky as a volcano, but by no means as warm, and Mary Ann—in tears and smudges—trying, on her knees, to wheedle the cold-hearted fire into kindling, while your eyes watered with the smoke, your teeth chattered with the cold, and the only hot thing in the room was your temper!

People sometimes talk of "nursing" a fire. That seldom refers to a gas-fire, and never to one of Wright's. In time of sickness, when an even heat has to be kept up overnight, the only plan is to sit up with your coal fire during the small hours, and administer its regular doses of fuel, as if the fire were an invalid, the scuttle a doctor's bottle, and every shovelful of coals a spoonful of the "Mixture." No wonder the disgusted subjects of **Old King "Coal"** begin to plot treason against him! If you feel that way, you need not hesitate to dethrone the grimy monarch, for his **Legitimate Successor** is close at hand. If you "can never get that fire to *go*," then it is time it *went*, and gave place to a Wright's "Eureka" Gas-Fire, which is as good as a coal fire in warmth and cheeriness, and far better in everything else. With Wright's Gas-Fires, you can have the heat as **soon** as you like, as **strong** as you like, and as **long** as you like. There are no delays, no smoke, no soot, no ashes, no coal dust, no—we had almost run on and said "no Mary Ann"! *That* would perhaps have been the best riddance of all; and indeed the lady who has Wright's "Eureka" Gas-Fires in her rooms (and a "Eureka" Gas-Cooker in her kitchen) has no need to quail at the domestic tyrant's awful announcement—"Which I wishes ter give yer notice, mum." Her mind may be quite at ease; for in the interval between the exit of Mary Ann and the advent of Eliza Jane, the **Eating and Heating** departments, at least, will give no trouble. Whatever statesmen may do, it is high time for you to abandon your **Policy of "Scuttle,"** and begin a new era of domestic comfort with Wright's "Eureka" Gas-Fires—the best to look at, and the best to sit at, of any kind of fire in the market.

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Telephone "277 HOLBORN."

GAS-TESTING.
MR. T. E. PYE (Eleven Years' Experience in Gas-Works Laboratories) is prepared to visit Gas-Works, and to REPORT to Management on Sulphur Impurities, Illuminating Power, &c., or as to general workings. Tests of Ammoniacal Liquor, Spent Oxide, &c.
No. 372, STANSTEAD ROAD, LEWISHAM.
Drawings Prepared for Works Extensions. Tracings Made.

WANTED, immediately, an experienced MAN in the construction and erection of large Station Meters for Gas-Works.
Apply, stating Age, Experience, and Wages, to No. 3786, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Foreman Retort Setter, used to Inclines. Permanency for a suitable Man.
Apply, stating Age, Experience, References, and Wages required, to the ENGINEER, Gas-Works, Saltley, BIRMINGHAM.

WANTED, a Man to set Retorts and do general Bricklaying at Works near Birmingham. Must be used to Regenerative Settings. Permanent Situation to suitable Man.
State Age, Experience, Wages required, &c., to No. 3753, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

OWING to the present Manager of the Ballymena and Harryville Gaslight Company, Limited, having been appointed to larger Works, the Company require a MANAGER.
Applications, accompanied by Testimonials and stating Salary expected, to be sent to Mr. SAMUEL HOOD, Chairman, Ballymena and Harryville Gaslight Company, Limited, Mill Street, BALLYMENA.

GAS-STOVE FOUNDRY.
SMART Man to take a responsible position. Must thoroughly understand the production of high-class fine Castings, and be able to undertake the management if necessary. Every assistance would be given to a good Man, with large Experience.
Apply, by letter, with full Particulars, to No. 3783, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-STOVES.
WANTED, by a leading Firm of Gas-Stove Makers, an experienced and capable Man to take CHARGE of PATTERN SHOP, and to act as Expert in introducing New Goods. Must have a thorough knowledge of the Business.
Apply, giving Particulars of Experience, Age, Salary, &c., to No. 3781, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS MANAGER WANTED.
WANTED, by the Arbroath Gas Corporation, a properly qualified person to act as MANAGER of their Works, which include Sulphate Plant. To enter upon his duties on Wednesday, the 1st of January next, or as soon thereafter as can be arranged.
Salary £200 per annum, with Free House, Coals, Gas, and Taxes (except Income-Tax).
Further Particulars may be obtained on application to David Chapel, Solicitor, Arbroath, Clerk to the Corporation, with whom Applications and eighteen *copies* of Testimonials are to be lodged on or before the 5th of December next.
Arbroath, Nov. 19, 1901.

WANTED, a good second-hand EXHAUSTER and STEAM-ENGINE, capable of passing 6000 cubic feet per hour.
Particulars to the MANAGER, Gas-Works, OAKENGATES.

WANTED, a Set (three or four) of good second-hand PURIFIERS complete; also TOWER SCRUBBER suitable for small Works of about Ten Millions per annum.
Particulars to the MANAGER, Gas-Works, WITNES.

TO BE LET on Lease—The Charlbury GAS-WORKS, with Manager's Cottage and Coal-Wharf. Possession the 1st of April, 1902.
Sealed Tenders to be sent to the Honorary Secretary, G. BORRIS, CHARLBURY, on or before the 31st day of December next.

The SUBSCRIPTION LIST opens to-day, TUESDAY, the 3rd DECEMBER, 1901, and will close for Town and Country on or before TUESDAY, the 10th DECEMBER, 1901.

The South Staffordshire Mond Gas (Power & Heating) Company.

Incorporated by Special Act of Parliament, 1 Edward VII., Session 1901.

CAPITAL - - £1,000,000.

96,500 Ordinary Shares of £10 each - - - -	£965,000
3,500 "B" Shares of £10 each - - - - - -	£35,000

The Liability of the Shareholders is limited to the amount of their Shares.

The "B" Shares are not entitled to dividend in any year until the Ordinary Shares have received a dividend for that year at the rate of 5 per cent. per annum, after which the "B" Shares are entitled to a dividend at the same rate, and then rank for dividend *pari passu* with the Ordinary Shares.

Present Issue - - - - - £450,000.

45,000 Ordinary Shares of £10 each - - - - - £450,000.

Applications from Directors and their Friends have already been received for 4000 Shares of £10 each.

There are now offered for Subscription 41,000 Ordinary Shares of £10 each.

PAYABLE:—

On Application - - - -	10s. per Share,
On Allotment - - - -	£1 10s. per Share,

and the Balance by Calls not exceeding £2 per Share at intervals of not less than three months.

Directors.

SIR BENJAMIN HINGLEY, BART., J.P., D.L., Hatherton Lodge, Cradley, near Dudley, *Chairman*. (Chairman of the South Staffordshire Iron Masters' Association.)
LUDWIG MOND, PH.D., F.R.S., 20, Avenue Road, Regent's Park, London, N.W., *Deputy-Chairman*. (Director of Brunner, Mond, & Co., Ltd.)
GILBERT HENRY CLAUGHTON, J.P., The Priory, Dudley. (The Earl of Dudley's Principal Mine Agent.)
JOSEPH BRAMAH COCHRANE, J.P., Pedmore Hall, Stourbridge. (Chairman of the South Staffordshire Coal Masters' Association.)
EDMUND HOWL, The Quarries, near Dudley. (General Manager of the South Staffordshire Mines Drainage Commission.)
GEORGE MACPHERSON, J.P., Green Royde, Pedmore, Stourbridge. (Philip Williams & Sons, Wednesbury Oak Iron-Works, Tipton.)
ROBERT MOND, M.A., F.R.S.E., 27, Berkeley Square, London, W. (Director of Brunner, Mond, & Co., Ltd.)
ALFRED MOND, 66, Lowndes Square, London, S.W. (Director of Brunner, Mond, & Co., Ltd.)

Bankers.

PARR'S BANK, LIMITED, Bartholomew Lane, London, Birmingham, and all other Branches.
BARCLAY & COMPANY, LIMITED, 54, Lombard Street, London, and Branches.
BIRMINGHAM DISTRICT AND COUNTIES BANKING COMPANY, LIMITED, 63, Colmore Row, Birmingham, and Branches.

Solicitors.

ASHURST, MORRIS, CRISP & CO., 17, Throgmorton Avenue, London, E.C.
JOHNSONS, BARCLAY, & LOWE, 36, Waterloo Street, Birmingham.

Brokers.

SHEPPARDS, PELLYS, SCOTT, & CO., 57, Old Broad Street, London, E.C.
LUMSDEN & MYERS, 29, Cornhill, London, E.C.
Birmingham—N. LEA & SON, 38, Bennett's Hill.
Liverpool—T. & T. G. IRVINE, 7, India Buildings, Fenwick Street.
Manchester—R. A. ARMITAGE & SON, 10, St. Ann's Square.

Auditors.

GIBSON & ASHFORD, Chartered Accountants, 39, Waterloo Street, Birmingham, and 23, Budge Row, London, E.C.

Consulting Engineer.

HERBERT A. HUMPHREY, Assoc.M.Inst.C.E., M.I.Mech.E., M.I.E.E., 38, Victoria Street, London, S.W.

Secretary (*pro tem.*) and Offices.

ERNEST CREWDSON, 17, Coleman Street, London, E.C.

PROSPECTUS.

THIS COMPANY has been incorporated by the South Staffordshire Mond Gas (Power and Heating) Company's Act, 1901, 1 Edward VII., chapter cxii., which defines the objects of the Company as follows:—To manufacture, supply, sell, and distribute within the South Staffordshire and East Worcestershire district (extending to about 120 square miles and set out in a plan enclosed with the prospectus) the producer-gas commonly known as Mond Gas, and any development of Mond Gas approved by the Board of Trade and any other producer-gas so approved for the purposes of motive or other power, heating, or any other purpose to which such gases can be applied, except that such gases shall not be supplied or used for the purposes of illumination; and to manufacture, sell, and deal in Sulphate of Ammonia and any other bye-products or residual products of the said gases; and generally to execute the powers and purposes of this Act; and the general powers of the Company include the erection, maintenance, improvement, letting and disposal of producers, engines, plant, fittings, machinery and works of every description and the acquisition and working of any Patents or Licenses (but so that the Company shall not acquire the exclusive use of any patent), and the selling or granting of licenses to use the same, and the making and carrying into effect of contracts and agreements and the doing of all acts and things authorized by this Act or necessary or proper for or incidental to the manufacture, supply, sale, and distribution of the said gases for the purposes aforesaid, and carrying into effect the objects of the Company.

The Act authorizes the Company to acquire by compulsory purchase seven sites, comprising about 134 acres, for the erection of works and manufacturing gas and, subject to certain provisions and restrictions, to lay, place, maintain, alter and remove mains, pipes, and other apparatus in or under any street within the district, and (so far as necessary for this purpose) to open, break up and interfere with any such street, or any sewer or drain, or any gas or water mains or pipes, or any electric, pneumatic, or other wires, lines, tubes, pipes, or apparatus.

The Act also confirms and makes binding on the Company an Agreement dated the 11th of January, 1901, made between Dr. Ludwig Mond (on behalf of himself and the owners for the time being of his patents) and Mr. Edmund Howl (for and on behalf of the Company), of which the leading provisions are:—

(1.) Dr. Mond shall grant to the Company a license to work and use within the district defined by the Act his patented inventions relating to gas production and ammonia recovery and all improvements thereon which Dr. Mond may invent or control in the future:

(2.) Dr. Mond will not grant licenses within the Company's district to any person or company for the sale and distribution of Mond Gas or any development thereof:

(3.) Dr. Mond will not grant licenses within the Company's district to any person or company to manufacture Mond Gas or any development thereof for his or their own use on more favourable terms than the terms on which he is for the time being granting licenses to persons or companies to manufacture the gas for their use outside the district.

(4.) Dr. Mond shall pay to the Company one-half of any sums he may obtain as license fee or royalty from such licenses as he may, subject to the above restrictions, grant in the Company's district.

The consideration for the grant of such license to the Company is by the Act to consist of the issue to Dr. Ludwig Mond of 7500 £10 shares fully paid up, of which the first 4000 are to be Ordinary and the remaining 3500 "B" shares, which shares are to be issued in the ratio of one share to every nine shares subscribed up to the amount of £500,000, and in the ratio of one share to every nineteen shares subscribed from £500,000 to £1,000,000.

The agreement and license are scheduled to the Act, a print of which can be seen at the Solicitors' offices.

During the proceedings of the Committees of both Houses of Parliament, it was stated in the evidence of eminent experts, including Lord Kelvin, Sir Frederick Bramwell, Professor Dewar and others:—

That Mond Gas can be manufactured from cheap bituminous fuel, commonly known as "slack," which is abundant in South Staffordshire:
That Mond Gas is the cheapest gas for heating and power purposes producible; the bye-product—Sulphate of Ammonia (of which about four times as much is obtained as in ordinary gas making)—covering a large proportion of the cost of production:
That Mond Gas is an ideal gas for metallurgical purposes:
That for making steel, heating iron, core-drying, annealing, and chemical works of all kinds, Mond Gas will be cheaper than coal and more clean and convenient:
That the supply of Mond Gas within the district from five stations as shown on the map is a perfectly practical scheme, and that the distribution of the gas is economical and practical:
That Mond Gas contains a larger percentage of Hydrogen and a smaller percentage of Carbon-monoxide than any other producer-gas, and is sufficiently cool and free from tarry matters to make its conveyance in pipes and its use in gas engines practical:
That using Mond Gas in gas-engines about four times the power can be obtained from the same fuel when compared with ordinary steam-engines, and nearly twice the power when compared with the most perfect steam-engines used in this country:
That the introduction of Mond Gas saves our store of coal and adds to our power of producing crops by supplying large quantities of valuable manure (Sulphate of Ammonia), which in ordinary furnaces is absolutely wasted:
That the use of Mond Gas produces no smoke and avoids all carting of coal and ashes.

Most of these witnesses had had the opportunity of studying the large Mond Gas installation, producing upwards of eight thousand million cubic feet per annum, at the works of Messrs. Brunner, Mond, & Co., Limited, Northwich, where this gas has been used for a number of years for heating a variety of furnaces, and also for driving large gas-engines coupled to dynamos for the production of electricity.

Detailed estimates of the cost of the plant required to carry out the objects of this Company, and of the profits to be expected, were also laid before the Parliamentary Committees. These estimates show that the establishment of five central stations calculated to produce twenty-five thousand million cubic feet of gas (when working with a load factor of 12 hours out of 24 for 300 days per annum) with all distributing

[*For continuation of Advertisement see next page.*

mains connecting these stations and serving the whole area of about 120 square miles to which the Act extends, will cost, including land, buildings, railway sidings, &c., £783,000, and that the sale of these twenty-five thousand million cubic feet of gas, at an average price of 2d. per 1000 cubic feet, will yield a profit of £125,000, or more than will be required for the payment of the maximum dividend allowed by the Act—viz., 10 per cent. on the share Capital of the Company. Thus an ample margin should be left, which, under the provisions of the Act, would be applied as to one-half in creating a reserve fund limited to £100,000, and the balance in making a reduction of the charges for gas supplied to the customers.

The Directors have decided to issue for the present £450,000 in 45,000 Ordinary Shares. It is expected that this sum will be sufficient to lay down the greater part of the mains for supplying the district and to erect works capable of supplying ten thousand million cubic feet of gas per annum. These works will be enlarged as soon as the increasing consumption of gas demands it. The additional Capital will be issued as required, and preference will be given to the shareholders of the Company. The sale of these ten thousand million cubic feet of gas at an average of 2d. per 1000 cubic feet should enable the Company to pay a handsome dividend, which, as the operations of the Company extend, ought soon to reach the maximum dividend allowed by the Act, as all future capital expenditure will be smaller in proportion to the increased producing power as compared with the cost of the first installation.

It has been generally admitted that, at the price of 2d. per 1000 cubic feet, the use of Mond Gas in place of coal for heating purposes and manufactures, will effect a considerable economy besides offering other important incidental advantages, while its use for power purposes will still be very economical at a higher price. The Act authorizes the Company to charge 4d. per 1000 cubic feet up to a consumption of four million cubic feet per quarter, and 3d. per 1000 cubic feet for larger consumers, and also to raise the price with the consent of the Board of Trade if the cost of good quality slack in the district should rise above 6s. per ton delivered at the works of the Company.

The area which the Company is authorized to supply under the Act, including as it does the important manufacturing centres of Dudley, Smethwick, Walsall, Wednesbury, West Bromwich, Wolverhampton, Bilston, Brierley Hill, Darlaston, Oldbury, Rowley Regis, Stourbridge, Tipton, and Willenhall, is an exceptionally suitable locality for the erection of central stations to supply Mond Gas to the manufacturer at his door, and numerous representatives of the iron, steel, glass, firebrick, and other industries gave evidence before the Parliamentary Committees that the supply of such gas would be of great value to them as individual manufacturers, and to their industries as a whole.

At a meeting of Iron and Coal Masters held in Birmingham on 21st February, 1901, with Sir Alfred Hickman, M.P., in the chair, the following resolution was passed:—"In the opinion of this Meeting the introduction of the Mond Gas System for the distribution of fuel gas for Power and Heating purposes (but not for illumination), from central stations, would be a great advantage to the industries of the South Staffordshire district, and should be encouraged by the manufacturers, local authorities, and others who take a serious interest in the welfare of the district."

The Directors wish to draw attention to the fact that this Company is under no obligation to supply any Corporation or local authority in bulk, nor are there any clauses in the Act giving any Corporation or local authority in the area power to purchase any part of the Company's undertaking.

The consumption of fuel in the district covered by the Act is estimated at four million tons per annum. The total amount of fuel to be converted into gas by the whole plant provided for in the estimates submitted to the Parliamentary Committees is 180,000 tons per annum, or 4½ per cent. of the total consumption, and the quantity to be gasified by the plant it is intended to erect in the first instance is 72,000 tons per annum, or 2 per cent. only of the total fuel consumed in the district.

This small quantity will in all probability be required within a very short time from the start, and the consumption should soon outgrow the producing capacity of the whole works covered by the estimate, and further extensions become necessary. The mains to be laid down in the first instance will be made large enough to distribute considerably more than the output of the whole works, and will only require the erection of additional compressing plant to enable them to do so.

The borrowing powers of the Company, extending to one-third of the issued Capital, but exercisable only when such issued capital has been fully paid up, will make very considerable extensions possible without any increase of the Company's authorized Capital.

An agreement has been entered into between this Company and the Power-Gas Corporation, Limited, for the construction and erection of the works of the Company by the Corporation at cost price, *plus* a profit of 7½ per cent., all the work to be carried out to the satisfaction of the Company's Engineer, and the cost to be audited by the Company's Accountants. This will secure to the Company a rapid and satisfactory completion of its works, the Power-Gas Corporation making the manufacture of such plant their speciality.

The agreement can be seen at the Solicitors' offices.

The Directors are confident that this Company promises to become a safe and remunerative undertaking, while it offers great advantages to the district in which it will operate, the various and important industries of which will receive a great impetus by the command of such a cheap source of heat and power as Mond Gas.

Application for a Stock Exchange settlement and quotation will be made in due course.

Applications must be made on the form below or that accompanying the prospectus, and forwarded with the amount payable on application to the Bankers of the Company. Where no allotment is made the deposit will be refunded in full, and where the allotment is less than the amount applied for, the balance of the deposit will be applied towards the instalment payable on allotment.

Prospectuses may be obtained from the Bankers, Brokers, Solicitors, and Auditors, and at the Offices of the Company.

LONDON, 26*th November*, 1901.

This Application Form may be used and should be sent with remittance for the amount of the deposit on the Shares, either to PARR'S BANK, LIMITED, Bartholomew Lane, London, E.C., or Branches; or to BARCLAY AND COMPANY, LIMITED, 54, Lombard Street, London, E.C., or Branches; or to the BIRMINGHAM DISTRICT AND COUNTIES BANKING COMPANY, LIMITED, 63, Colmore Row, Birmingham, or Branches.

The South Staffordshire Mond Gas (Power & Heating) Co.

Incorporated by Special Act of Parliament, 1 Edward VII., Cap. cexli., 1901.

CAPITAL .. .. .. £1,000,000.

DIVIDED INTO

93,500 ORDINARY SHARES OF £10 EACH, AND 3500 "B" SHARES OF £10 EACH.

ISSUE OF 45,000 ORDINARY SHARES OF £10 EACH.

Payable: 10s. on Application; £1 10s. on Allotment; and the Balance by Calls not exceeding £2 per Share, at intervals of not less than three months.

FORM OF APPLICATION FOR ORDINARY SHARES.

TO THE DIRECTORS OF

THE SOUTH STAFFORDSHIRE MOND GAS (POWER & HEATING) CO.

GENTLEMEN,

Having paid to your Bankers the sum of £ : : , being a deposit of 10s. per Share on application for.....Ordinary Shares in the above Company, I hereby request you to allot me that number of Shares; and I agree to accept such Shares, or any less number that may be allotted to me, upon the terms of the Prospectus of the Company, dated the 26th November, 1901, and of the Regulations of the Company, and I authorize you to place my name upon the Register of Shareholders in respect of any Shares so allotted to me, and I agree to pay the further instalments payable in respect of the said Shares as and when called upon so to do.

Please write very distinctly.

Name (in full) _____
(Mr., Mrs., or Miss).

Address _____

Occupation, Rank, or Usual Title _____

Ordinary Signature _____

Date _____ 1901.

FOR SALE—Station Meter in good condition, 4 ft. 6 in. diameter, 2 ft. 10 in. long, 2500 cubic feet per hour capacity, with 6-inch Bye-Pass Valves and Connections.

Apply to R. DEMPSTER & SONS, LTD., ELLAND.

FOR SALE—Twenty-four Lamp Columns and Wrought-Iron Scrolls. Good design. Six cwt each. One Lamp Column, with 300-candle power Welsbach Arc Lamp; and one SUGG "LAMBETH" LANTERN.

For Photographs and Particulars, apply to H. WIMHURST, Gas-Works, SLEAFORD.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

JOURNAL OF GAS LIGHTING, &c.

COMPLETE Set for disposal, Vols. 1 to 53 bound in cases; the remainder unbound. Also complete Set of TRANSACTIONS OF BRITISH ASSOCIATION of GAS MANAGERS and GAS INSTITUTE, in first-class condition.

Address offers to No. 3776, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO BE SOLD—

GASHOLDER (and Cast-Iron Tank), 17,500 cubic feet capacity.

CENTRE-VALVE, 15 in. diameter, by Walker for Four Purifiers.

Four PURIFIERS, 10 feet square, in line, with Planed Joints, Walker Centre-Valve, Covers, and Traversing Crab Lifting Gear. Will be refixed equal to new.

Write J. WRIGHT, Bridge House, BLACKFRIARS, E.C.

J. FIRTH BLAKELEY & CO., Thornhill, Dewsbury, have FOR SALE cheap—

ANNULAR CONDENSERS up to 16-in. Connections.

EXHAUSTERS and ENGINES up to 60,000 feet per hour.

"HOLMES" and "CLAPHAM" WASHERS and TOWER-SCRUBBERS.

GASHOLDERS, 15 ft., 25 ft., 30 ft., and 50 ft. diam.

PURIFIERS, sets of 6 ft., 8 ft., 10 ft., 12 ft., and 20 ft. square.

J. F. B. & Co., are the largest Buyers and Dealers in SECOND-HAND GAS PLANT, and have an extensive Stock. Inquiries solicited from both Vendors and Purchasers of the same.

CITY OF LOUVAIN.

LIGHTING CONTRACT.

THE Contract for the Lighting of Louvain by Gas will Expire on Jan. 1, 1905. The Municipality are therefore prepared to receive, before Dec. 31, 1901, PROPOSALS for Lighting the City, either by Gas or Electricity, or by the Two Systems combined, from Gas or Electric Light Companies.

Address the BURGOMASTER, LOUVAIN, BELGIUM.

ALDERSHOT GAS AND WATER COMPANY.

THE Directors are prepared to con- sider TENDERS for the purchase of surplus TAR (about 1000 Tons) produced at their Gas-Works, Ash Road, Aldershot (Tongham Station, L.S.W. Rly.), and North Camp, S.E. Rly., for a Year from Jan. 1, 1902, to Dec. 31, 1902.

Specification and Conditions can be obtained on application.

Tenders to be sent in to the undersigned, endorsed "Purchase of Surplus Tar," to arrive not later than Nine a.m., Friday, Dec. 6, 1901.

The highest or any Tender not necessarily accepted.

By order,
R. W. EDWARDS, Secretary.

Nov. 23, 1901.

ALDERSHOT GAS AND WATER COMPANY.

THE Directors are prepared to con- sider TENDERS for the supply of best SULPHURIC ACID, delivered in Tank-Waggons (or Carboys, if necessary) to Tongham Siding, L.S.W. Rly.

Particulars on application.

Tenders to be sent in to the undersigned to arrive not later than Nine a.m., Friday, Dec. 6, marked "Sulphuric Acid."

The lowest or any Tender not necessarily accepted.

By order,
R. W. EDWARDS, Secretary.

CORPORATION OF LEICESTER.

RETORTS AND FIRE-BRICKS.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply and delivery of RETORTS and FIRE-BRICKS.

Specifications, Quantities, and Form of Tender can be obtained from the Engineer.

Tenders, addressed to Mr. Councillor Edwards, Chairman, and endorsed "Tender for Retorts, &c.," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, the 7th of December, 1901.

The Committee do not bind themselves to accept the lowest or any Tender.

ALFRED COLSON, M.Inst.C.E. and M.Inst.E.E., Engineer and Manager.

Offices: Millstone Lane, Leicester, Nov. 30, 1901.

URBAN DISTRICT COUNCIL OF STOURBRIDGE.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply and erection of Three additional PURIFIERS, with Elevator and Conveyor, also VALVES and CONNECTIONS, on their Gas-Works.

Drawings may be seen, and Specifications had, on application to the undersigned.

Tenders to be sent in as per Specification on or before Dec. 17, 1901.

By order,
WM. NORTH,
Engineer and Manager.

Gas-Works, Stourbridge, Nov. 23, 1901.

THE BRISTOL GAS COMPANY.

TENDERS FOR TAR.

THE Directors of this Company invite TENDERS for the purchase of the TAR to be produced at all or either of their three Stations during a period of One, Two, or Three Years, commencing on the 1st day of January, 1902.

The annual quantities of Tar produced at each of the Stations at present are, approximately, as follows:—

Avon Street	750,000 gallons.
Canons' Marsh	550,000 ,,
Stapleton	1,000,000 ,,

Further Particulars, with Forms of Tender, may be obtained on application to the undersigned, to whom also Tenders, sealed and endorsed "Tender for Tar," must be delivered not later than Wednesday, the 18th day of December next.

JOHN PHILLIPS,
Secretary.

Chief Offices, Canons Marsh, Bristol, Nov. 25, 1901.

ISLE OF THANET GAS COMPANY, MARGATE.

THE Directors of the above Company are prepared to receive TENDERS for the supply of the following CAST-IRON MAINS:—

1000 yards of 6-inch CAST-IRON SOCKET and SPIGOT PIPES.

1000 yards of 4-inch CAST-IRON SOCKET and SPIGOT PIPES.

Also SPECIAL CASTINGS.

Further Particulars as to time of delivery, &c., may be obtained on application to the Engineer, Mr. James Dougall.

Tenders, endorsed "Cast-Iron Pipes," to be addressed to the Chairman, and to be delivered at the Offices of the Company not later than Dec. 12, 1901.

By order,
THOS. C. FULLER,
Secretary.

Offices: The Dane, Margate, Nov. 29, 1901.

SHOTLEY BRIDGE AND CONSETT DISTRICT GAS COMPANY.

TENDERS FOR TAR.

THE Directors of this Company invite TENDERS for the purchase of the TAR to be produced at their Works during the Year 1902.

The Contractor to provide Casks, and to accept delivery at Blackhill Station.

Tenders will be received not later than Dec. 11, 1901.

Quantity produced about 70,000 Gallons.

M. RICHLEY,
Secretary.

Gas Offices, Shotley Bridge,
Nov. 20, 1901.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to DEBENTURE STOCK and BONDS, WILL BE CLOSED at Four o'clock p.m. on Tuesday, the 10th prox., for the Half Year ending on the 31st prox., and WILL BE RE-OPENED on the morning of Wednesday, the 11th prox.

The Interest for the Half Year will be payable on the 1st of January next to the Proprietors registered on the closing of the Books.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., Nov. 29, 1901.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ILFORD GAS COMPANY.

NEW ISSUE OF £10,000 ORDINARY "C" STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Dec. 9, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

KINVER GAS COMPANY, LIMITED.

The Liquidator of this Company invites
TENDERS
FOR THE PURCHASE OF THE
KINVER GAS-WORKS as a Going Concern.

THE Works are Leasehold for 99 Years, having 58 years still to run, at the annual rent of £10.

The Erections consist of a Retort-House, Foreman's House, Gasholder, Retort-Beds, and Wooden Stabling.

The Plant and Fixtures are also included in the sale.

Particulars and Forms of Tender may be had on application on or about Friday, the 22nd inst., and afterwards Sealed Tenders to be sent in to Mr. T. H. Gough, the Liquidator, at his Offices, 267, Castle Street, Dudley, on or before Twelve o'clock Friday, the 13th of December, 1901.

For any further Information, apply
Mr. T. H. GOUGH,
Liquidator,
267, Castle Street, DUDLEY; or
Messrs. WALL and JAMES,
Solicitors, STOURBRIDGE.

SALE OF TYNEMOUTH GAS STOCK.

MR. ROBERT M. TATE is instructed by the Directors of the Tynemouth Gas Company to SELL BY AUCTION, at the Gas Offices, Bedford Street, North Shields, on Tuesday, Dec. 10, at Three o'clock,

£10,000 NEW ORDINARY STOCK,

Which bears a Maximum Cumulative Dividend of Five per cent. per annum.

This has been paid ever since the Year 1866.

The Stock will be put up in lots of £100 each, nominal value. A deposit of £10 per cent. to be paid on the purchase money at the Sale, the remainder to be paid to the Company's Bankers, Barclay and Co., Ltd., Howard Street, North Shields, on or before the 30th day of December next. The Stock will be registered in the name of the purchaser free of expense, and will rank for Dividend from the 1st of January, 1902.

J. J. CARR,
Secretary.

Gas Offices, 97, Bedford Street,
North Shields.

COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

With Elevators and Conveyors worked by Steam or Gas Engine.

GEORGE WALLER & CO.
165, QUEEN VICTORIA STREET, E.C.;
And at STROUD GLOUCESTERSHIRE.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that an EXTRAORDINARY GENERAL MEETING of the Proprietors of the above-named Company will be held at the Offices of the Company, No. 63, Chancery Lane, in the County of London, on Friday, the 20th day of December, 1901, at 3.30 o'clock in the afternoon precisely, to consider, and, if thought fit, approve by means of a Resolution, a proposed application to the Board of Trade for a Provisional Order authorizing the Company to raise Additional Capital and construct Additional Gas-Works.

The following Resolution is proposed to be submitted to the Meeting:—

RESOLUTION.

"That application be made to the Board of Trade, under the 'Gas and Water Works Facilities Act. 1870,' for a Provisional Order (to be confirmed by Parliament in the next Session) empowering the Company—

"To raise Additional Capital.

"To construct Additional Works for the manufacture of Gas and for other purposes."

Dated this 4th day of December, 1901.

By order of the Board,
WILLIAM E. ROBERTS,
Secretary.

Now Ready, Price 15s., Limp Cloth,

— TWENTY-FIRST YEAR —

AN

ANALYSIS OF THE ACCOUNTS

OF THE

METROPOLITAN WATER COMPANIES,

AND OF THE

CORPORATION WATER UNDERTAKINGS

OF

EDINBURGH, GLASGOW, & MANCHESTER,

FOR THE YEAR 1900-1901.

Compiled by

LASS, WOOD, & DREW,
Chartered Accountants.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

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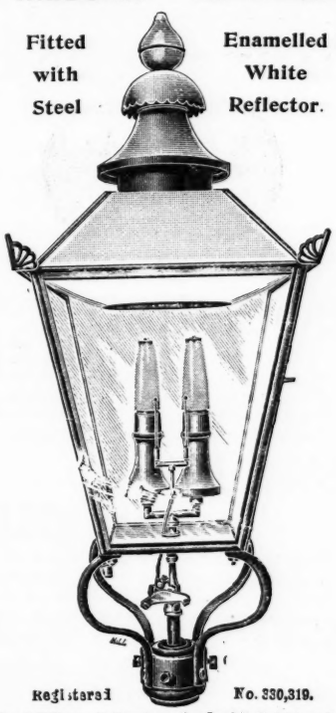
"KILBURN" LANTERN.

Fitted with Steel

Enamelled White Reflector.



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CANDLE SAFETY LAMPS.

Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

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WILBY'S Patent Improved
DRILLING-MACHINE
FOR DRILLING & TAPPING
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WE have now completed Improvements which our experience of over seven years has led us to adopt; and we feel confident that we are placing upon the Market a Tool that will give satisfaction.

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For blowing Air into Gas Purifiers for the purpose of

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Full Particulars on application.

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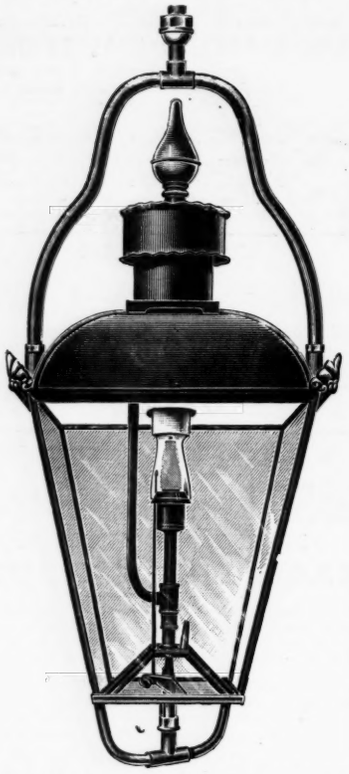

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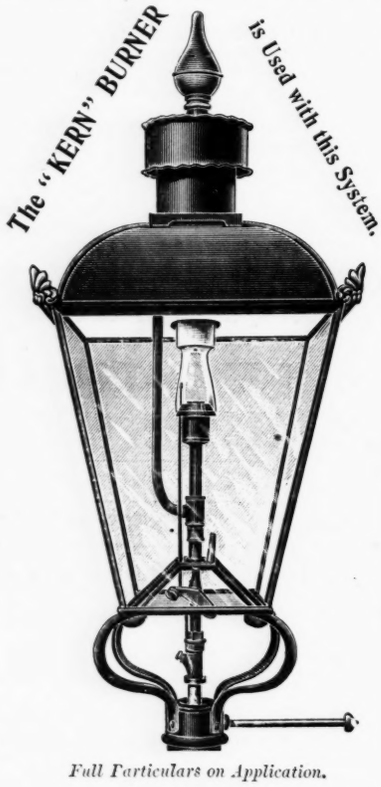

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TO SUIT
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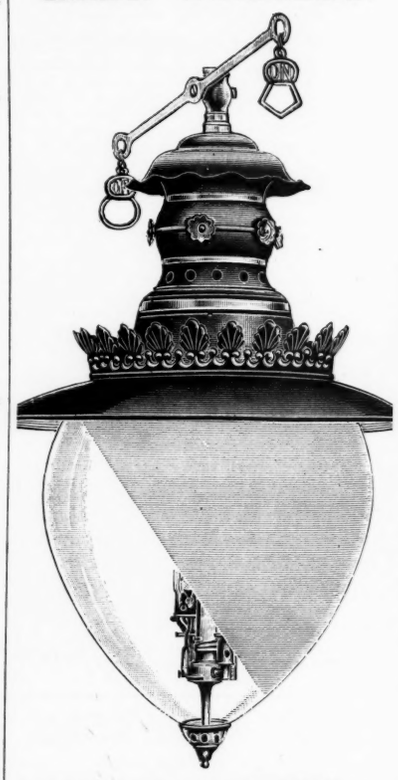

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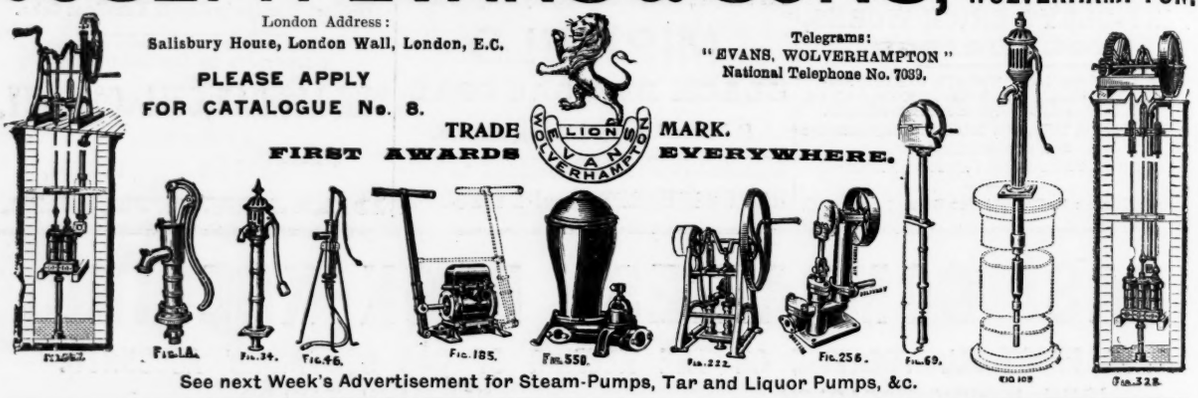

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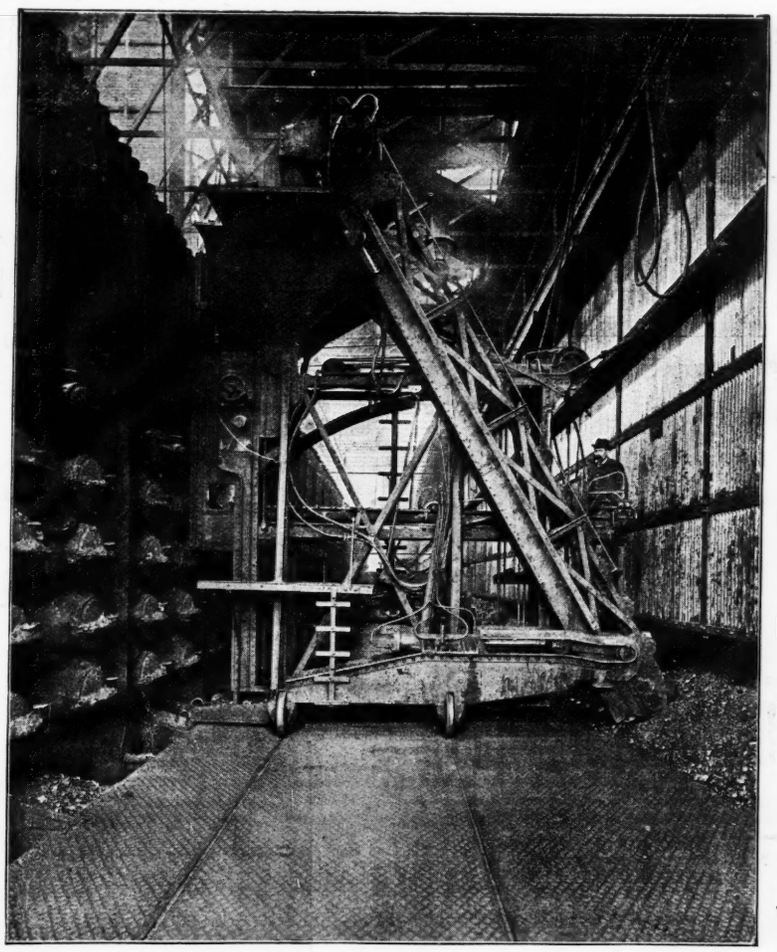

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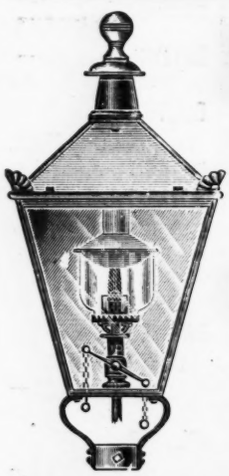

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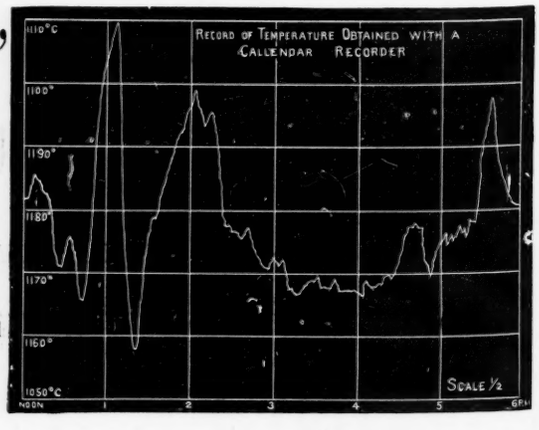

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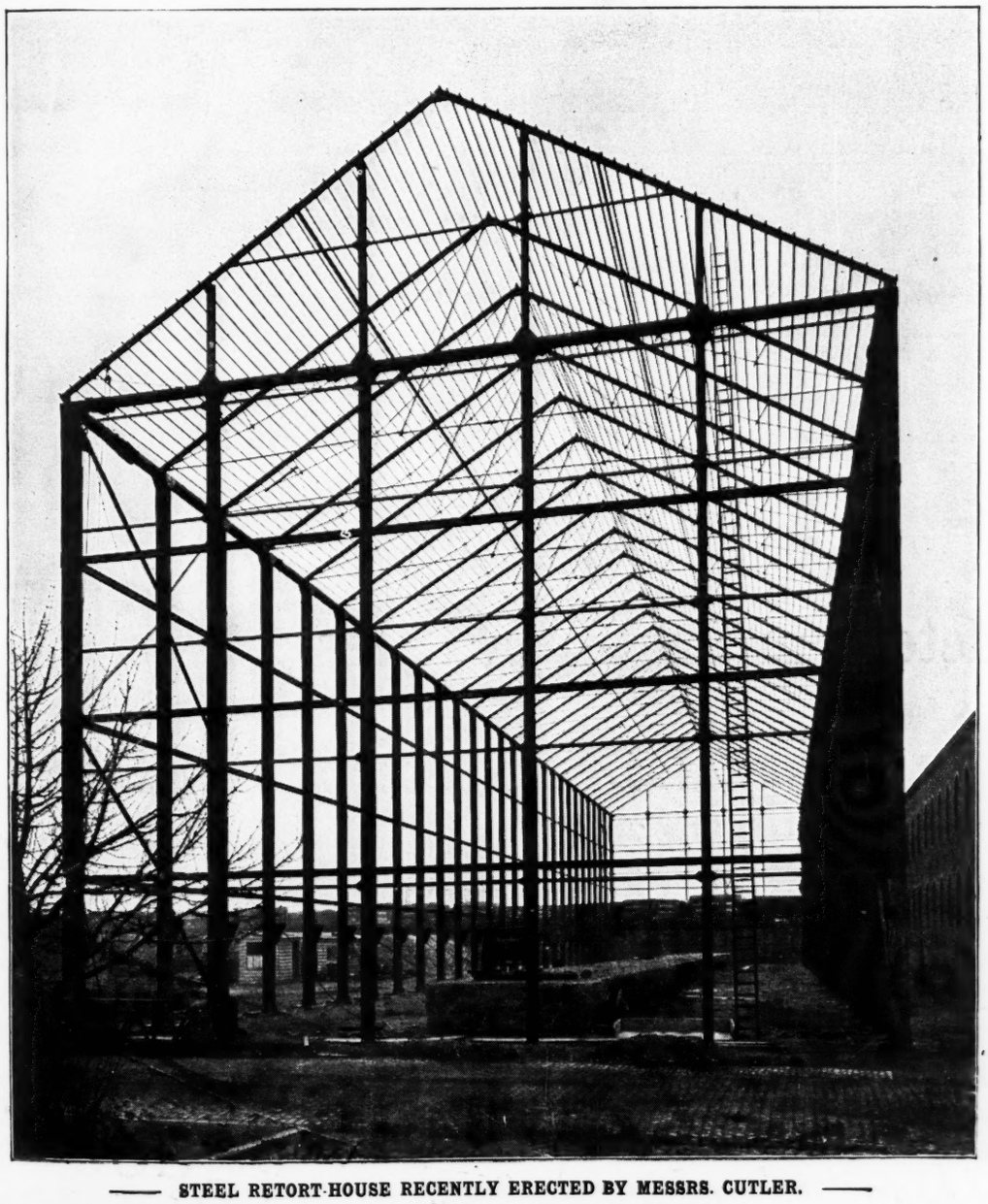

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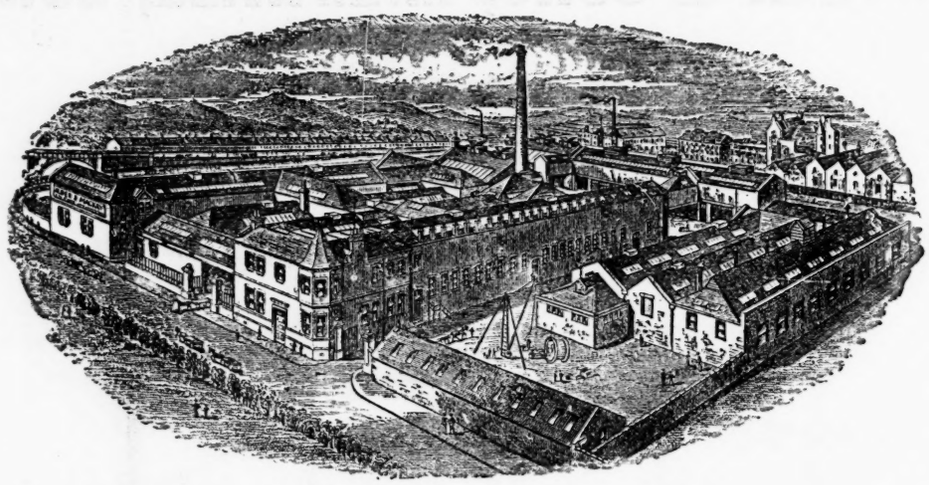

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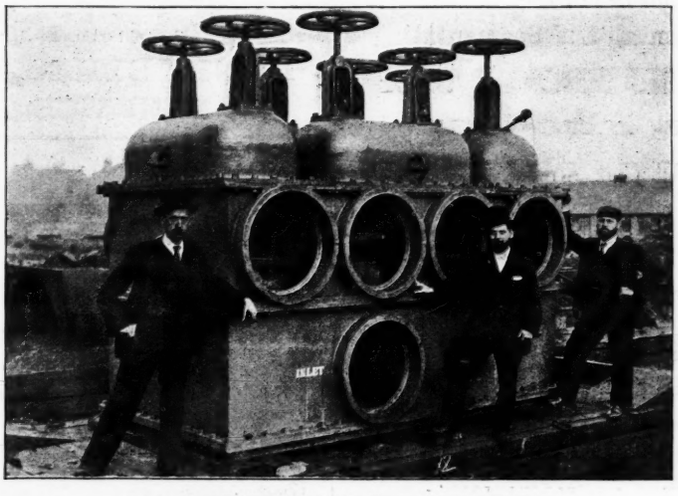

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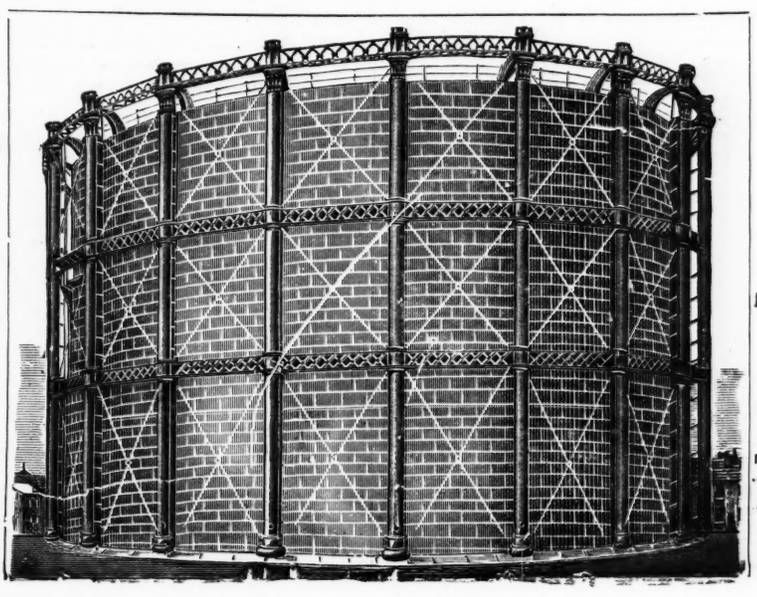

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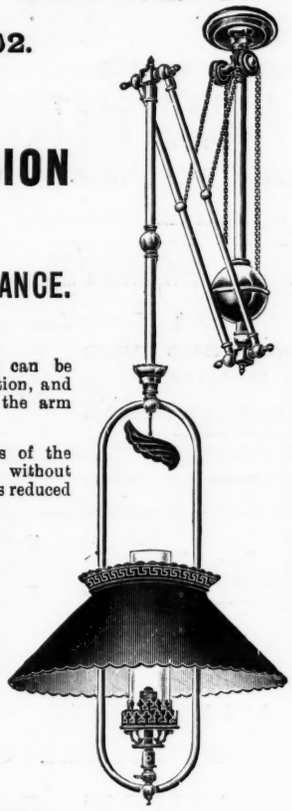

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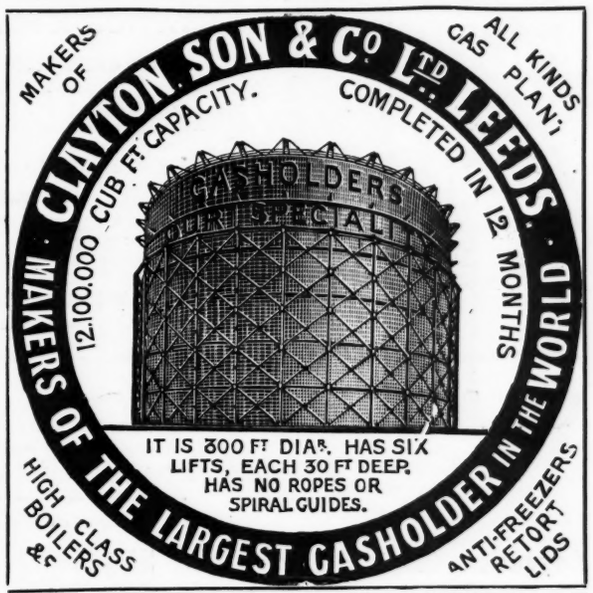
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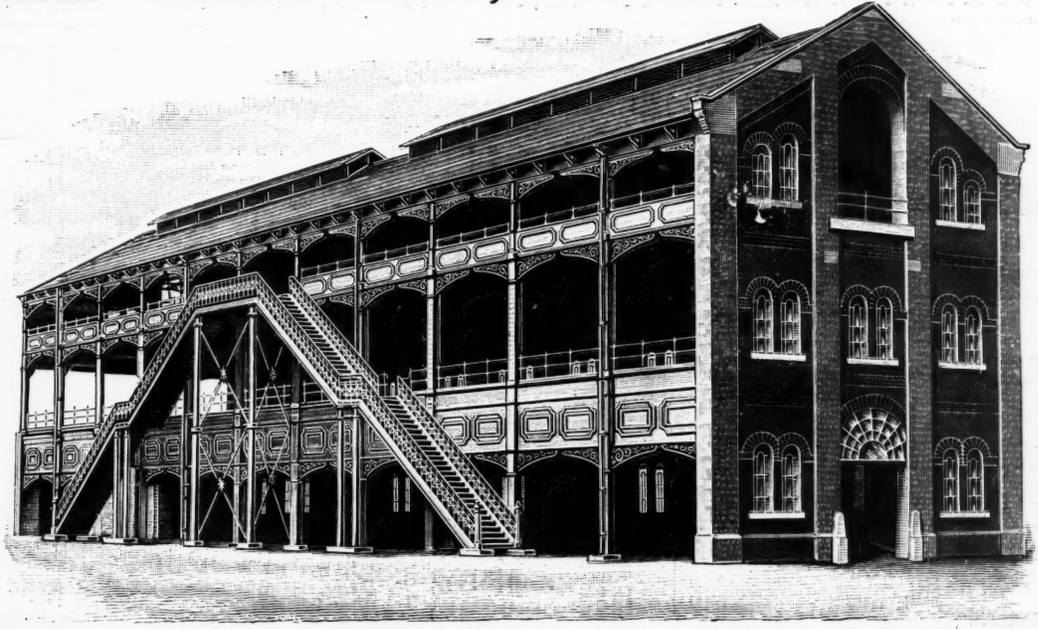

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